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Over the Internet

Electronic Commerce Program

ELECTRONIC COMMERCE OVER THE INTERNET

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Abstract

Electronic commerce value-added networks (VANs) have earned high loyalty among their user base. Eighty one percent (81%) of users are either "satisfied" or "very satisfied" with their VAN. As a result, VANs have lowered their immediate risk of being abandoned by their users in favor of direct trading partner-to-trading partner connection over the Internet. Based on analysis of user plans and technology directions, INPUT forecasts that in the year 2000, VANs will transact 72% of the value of goods and services traded through electronic data interchange (EDI), and control a further 18% through their recently announced Internet strategies.

Internet commerce over the World Wide Web (WWW) is growing at a rate of over 370% from $70 million in 1995 to $165 billion in the year 2000. This growth is far in excess of the growth of EDI-facilitated commerce, but there are opportunities for the EDI software companies to participate in the WWW market through provision of back-end fulfillment capabilities for web servers.

This report, *Electronic Commerce Over the Internet*, gives a full explanation of the current status of Internet/EDI and WWW commerce. It is based on interviews with 293 trading companies, all major VANs, EDI software companies, web server vendors and users. As a result, it authoritatively forecasts the direction of these markets to the year 2000, and answers questions which, previously, were the subject of opinions and speculations.

The report contains vital information and recommendations for anyone who needs to consider how the Internet will affect their electronic commerce programs. This specifically includes the VANs, EDI software companies, web server vendors and users.

The report contains 96 pages and 42 exhibits.

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Electronic Commerce Program

Electronic Commerce Over the Internet

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Introduction

A
Purpose

Over the past twelve months, the explosive growth in the number of connections to, and in the usage of, the Internet for business purposes has been well documented. However, as yet there is still relatively little actual commerce being conducted over the Internet. Nevertheless, there is a great deal of speculation that companies conducting electronic data interchange will move their business from the value added networks (VANs) that are currently carrying the traffic to the Internet, thereby causing major dislocations in the market for VAN services.

There has also been discussion as to the impact of the World Wide Web (WWW) on electronic commerce. Currently, business-to-consumer transactions account for about 60% and business-to-business for about 40% of the commerce transacted over the WWW. INPUT forecasts that by the year 2000 there will be a shift so that 80% of the commerce will be business-to-business, and 20% will be business-to-consumer.

The purpose of this report is to investigate the impact of the Internet on electronic commerce, and to quantify the extent to which companies will transfer their electronic business exchange to the Internet. This report also forecasts the directions of these markets over the five-year period from 1996 to the year 2000.

The major electronic commerce media covered by this report are electronic data interchange (EDI) and the electronic marketplace constituted by the World Wide Web (WWW).

This study is intended to help:

- EDI software vendors decide whether to develop an Internet EDI capabilities for Internet-based EDI and WWW-based commerce

- EDI network operators, also known as value-added networks (VANs), understand the impact that the Internet will have on their business

- EDI users, who must evaluate the various communications and services strategies available through the Internet and the VANs

- World Wide Web (WWW) server and browser software developers, who must decide whether to enhance the commercial capabilities of their offerings

- Trading companies who must evaluate whether it is appropriate for them to sell their goods and services over the Internet

B
Methodology

Primary research sources were used to develop and analyze the findings of this report, including:

- Interviews with representatives of the VANs and EDI software companies

- Interviews with representatives of WWW server and browser developers, and companies that use these products to sell on the Internet

- Surveys of 293 EDI VAN users and companies that are using the Internet to conduct EDI communications

INPUT also completed secondary research from its vast library of on-line and collateral-based information sources and publications. This supplemented and verified the data that was gathered by primary research.

C
Scope

Electronic commerce over the Internet is conducted in two ways:

- Using the Internet as a carrier for business transactions between organizations' computer applications, or EDI. EDI over the Internet is similar in concept to EDI over VANs. Using a messaging-based

technology, the contents of the message files are defined in a structured manner in accordance with generally accepted EDI standards.

- Using the WWW environment where electronic commerce is comprised of user transactions for goods or services. This data exchange does not follow the same structured approach as is the case for EDI. Rather, the data format follows HTML protocols.

D
Industry Structure

1. Value-Added Networks (VANs)

VANs perform the carrier function that supports the transmission of EDI messages on behalf of business and governmental organizations. Only recently have they initiated strategies to take into account the role of the Internet as another communications medium. Companies such as GEIS, Sterling, Harbinger, and AT&T Easylink provide these services.

2. EDI Translation Software Vendors

To date, EDI translation software has been configured to work with the communications requirements of the VANs. To support access to the Internet, the software vendors are reconfiguring their communications capabilities to support TCP/IP and to implement appropriate data security protocols. Companies such as Supply Tech, Sterling, Harbinger, Premenos, St. Paul and TSI International sell EDI translation software for a variety of platforms, including PCs, UNIX and AS/400.

3. WWW Clientserver Software Vendors

Companies such as Netscape, Open Market, SpyGlass, Frontier Technologies and Process Software develop software for the server and browser marketplace. These software platforms enable the establishment of electronic commerce on the WWW.

4. WWW-based Vendor Organizations

Organizations such as the Internet Shopping Network, Branch Mall, and CDNow have developed sales environments using the server software from the vendors noted above. For an analysis of this marketplace in detail, refer to INPUT's companion report, *Electronic Catalogs, Web Storefronts and Internet Malls.*

E

Related Reports

Much of the information and analysis included in this report is based on user and vendor surveys as part of INPUT's ongoing electronic commerce and Internet market analysis programs. For more information on electronic commerce over the Internet, the reader is referred to these other INPUT reports :

- *Electronic Catalogs, Web Storefronts and Internet Malls*

- *Electronic Commerce in Government*

- *Electronic Commerce Markets and Forecast, 1995 - 2000*

- *Sales and Marketing on the Internet*

- *The Future of Web Browsers and Servers*

- *Using the Internet for Business Operations*

II
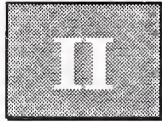
Executive Overview

A
Introduction

In spite of the phenomenal and well documented growth of the Internet over recent months, the fact remains that relatively little commerce is actually being conducted over the Internet at this time. With very high expectations for the Internet as a trading environment, dire speculations are being made regarding the fate of the value-added networks (VANs) and other channels that currently carry the commerce that supposedly will move to the Internet.

INPUT has conducted primary research into the subject of electronic commerce over the Internet, and this report documents the results. INPUT surveyed 293 trading companies currently engaged in electronic commerce, as well as the VANs, EDI software companies, World Wide Web (WWW) server and browser vendors, and operators of Internet malls.

As a result, this report moves beyond the speculation to document the current state of Internet commerce comprehensively, and to forecast authoritatively the directions, trends and market sizes over the five-year period from 1996 to the year 2000.

The report documents both the movement of electronic data interchange (EDI) traffic to the Internet and the growth of commerce through electronic marketing and purchasing over the WWW.

B
Major Findings

1. Perceptions and Intentions of EDI Users

It is often stated that EDI users are anxious to be rid of the perceived high cost of using a VAN to intermediate their EDI transactions, and are interested in moving their traffic to the Internet to save cost. INPUT's research has found that this is not generally the case.

While users are sensitive to the VANs' costs, they are aware that they are paying for services beyond the basic transport service that the Internet could potentially provide. Users value these additional services, and are generally willing to pay for them. Additional services include:

- Assistance in converting trading partners to EDI

- Logging audit trails

- Assigning accountability in case of a lost transaction

Exhibit II-1 displays the overall level of satisfaction that EDI users have with the VAN they are using. To have a zero percentage of responses either "Somewhat Dissatisfied" or "Very Dissatisfied" is a strong endorsement indeed! Eighty-one percent (81%) of respondents were "Somewhat Satisfied" or "Very Satisfied."

Exhibit II-1

Users' Overall Satisfaction Level with VANs
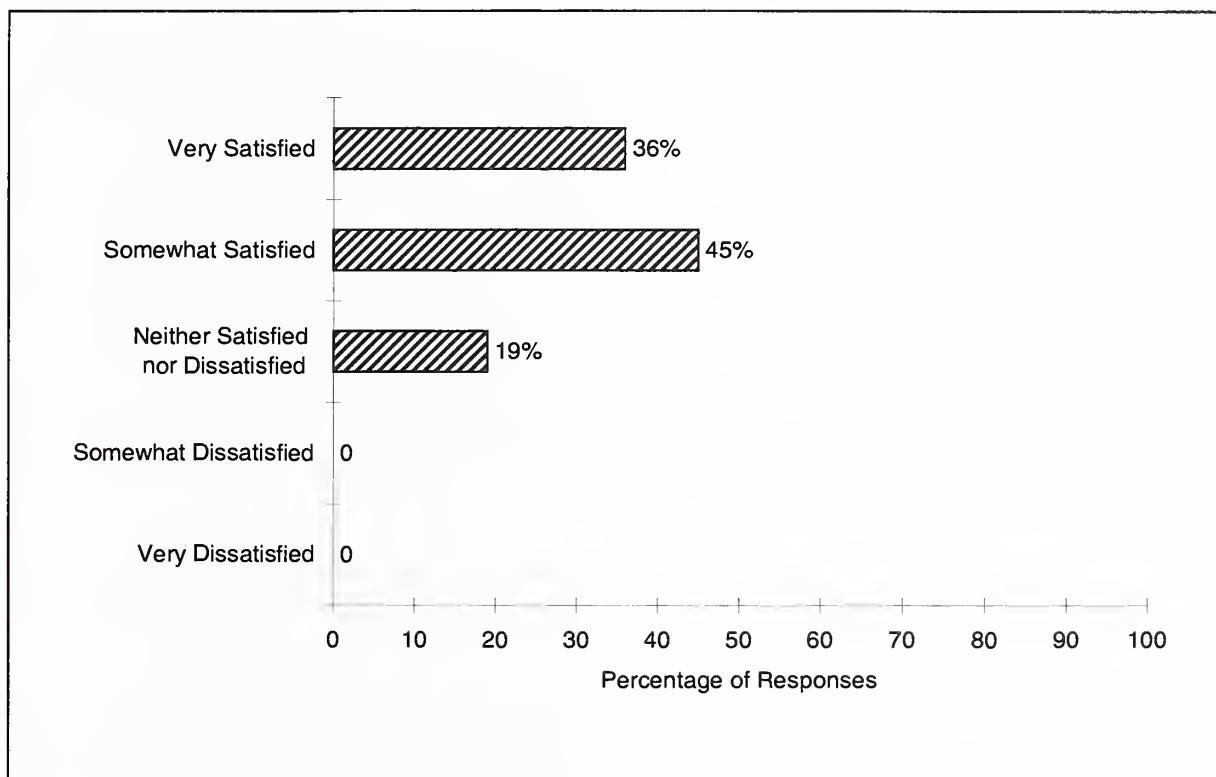
Source: INPUT

Chapter IV gives details of the responses supporting the conclusion that EDI users are not ready to rush to the Internet and abandon the VANs.

However, users are intensely interested in the potential of the Internet for EDI, although they do not give consistent reasons for this. When asked what reasons they might have for not using the Internet, the perceived lack of security ranked highest with 59% of responses, as shown in Exhibit II-2.

Exhibit II-2

Reasons for Not Using the Internet for EDI

Horizontal bar chart. Vertical axis categories from top to bottom: Security 58%, No Need 33%, Lack of Familiarity 9%, Lack of Support 0, Lack of Reliability 0, Lack of Accountability 0, Non-repudiation 0. Horizontal axis labeled "Percentage of Responses" from 0 to 100.
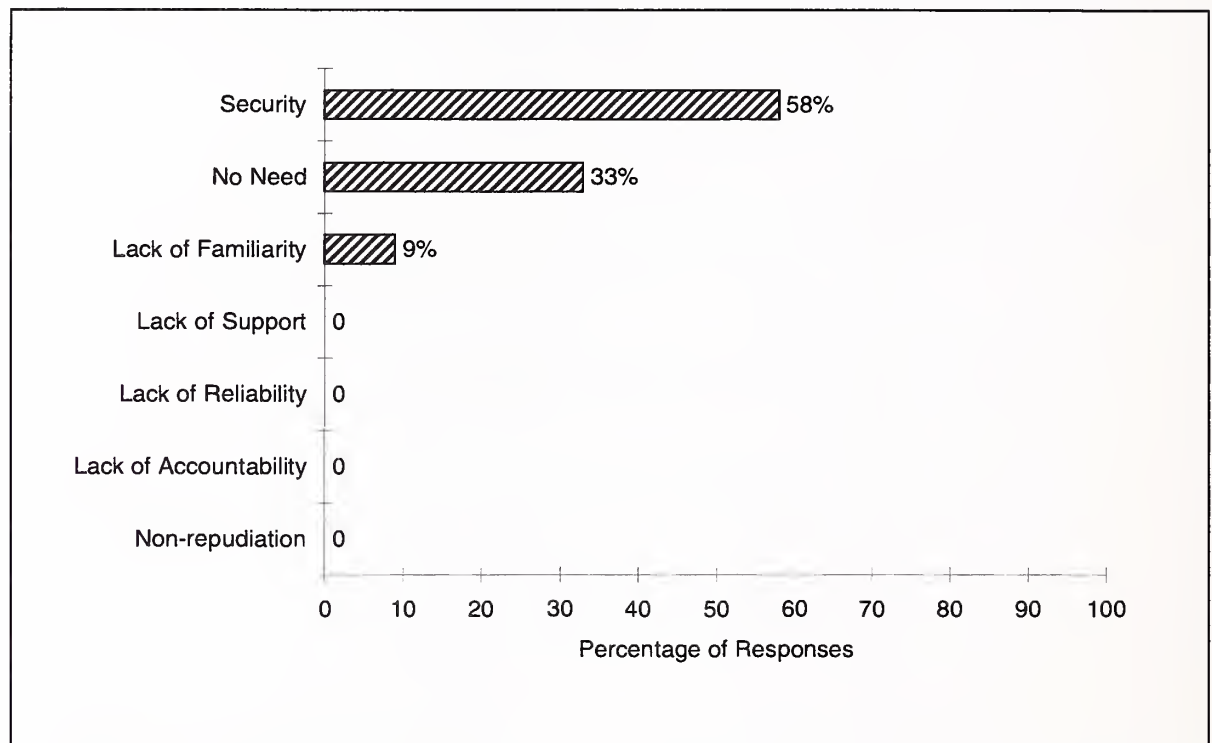
Source: INPUT

INPUT research has found (as documented in Chapter VI—Enabling Technologies) that, in fact, adequate Internet security mechanisms exist. Proper application of them, over time, will generate enough good press that the perception of the Internet as being insecure will change. When this happens, INPUT projects that users will be ready to move some applications to the Internet in parallel with other VAN applications, where the VAN's "value-added" is needed.

2.   VAN Strategies

Many of the major VANs, specifically Sterling, Harbinger and GEIS, have recently adopted proactive strategies for accommodating the Internet in their portfolios.

INPUT has classified these strategies into three types:

- On-demand connectivity essentially allows user companies to send messages through the Internet, but without the necessary security to make this a useful option. VANs in this category are adopting a "wait and see" attitude and waiting for there to be an evident customer demand (rather than only an interest) before offering a comprehensive Internet service.

- Controlled connectivity is a strategy adopted by other VANs who are viewing the Internet as another way of routing traffic from trading companies to that VAN's network. This strategy is oriented toward transport options, but not toward cost saving, for the user company.

- Open connectivity is the strategy that views connection to the Internet in a similar way to interconnection to any other EDI VAN. The philosophy of this strategy is that trading partners on the Internet are an expansion of the entire EDI marketplace, and the strategy facilitates the communication with Internet-connected trading partners equally with VAN-connected partners.

3.   EDI Software Vendor Strategies

Some EDI software vendors are taking the approach of selling packages that will enable trading partners to communicate with each other over the Internet without using the services of a VAN. The most prominent company in this category is Premenos with its product Templar. Premenos is licensing Templar to other EDI software vendors, and to date DND Worldwide, APL Group and TSI have purchased licenses.

Templar satisfies the major technical requirements, providing:

- Message authentication

- Integrity

- Confidentiality

- Non-repudiation of origin and receipt

Although all of these characteristics are delivered in a "standards-based" manner, the fact remains that each communicating trading partner needs its own copy of Templar, and somewhat equivalent products, such as Harbinger's (also "standards-based," but different standards), will not intercommunicate with it. As a result, Templar is sometimes referred to (rather unfairly) as a proprietary and "closed" product.

Although Premenos' strategy is somewhat based on the assumption that there is a groundswell of pressure in the EDI user companies away from the VANs (which, as explained earlier, INPUT has found not to be the case), INPUT believes that there will be healthy sales of Templar, and similar products, but only when there is industry agreement on which set of standards to use. The market will expand when Templar users can interface to sites that use alternative EDI software.

C
Market Size and Forecast

Chapters IV and V give INPUT's market size estimates and forecast for 1996-2000 for:

- EDI network services market

  - Traditional VAN services revenue

  - Internet-related VAN services revenue

- EDI software market

  - Traditional EDI software for VANs

  - Internet EDI software (VAN-related)

  - Internet EDI software (non-VAN)

- WWW server software market

- Value of goods and services traded using EDI (Internet and non-Internet)

  - Sales through traditional VANs

  - Sales through VANs' Internet offerings

  - Sales through Internet EDI—not VAN-related

- Value of goods and services traded over the WWW

  - Business-to-business sales

  - Business-to-consumer sales

1. Value of Goods and Services Traded Using EDI

The worldwide value of goods and services that INPUT forecasts to be traded using EDI in the year 2000 is shown in Exhibit II-3.

Exhibit II-3

Value of Goods and Services Traded Using EDI (Internet and Non-Internet) in the Year 2000
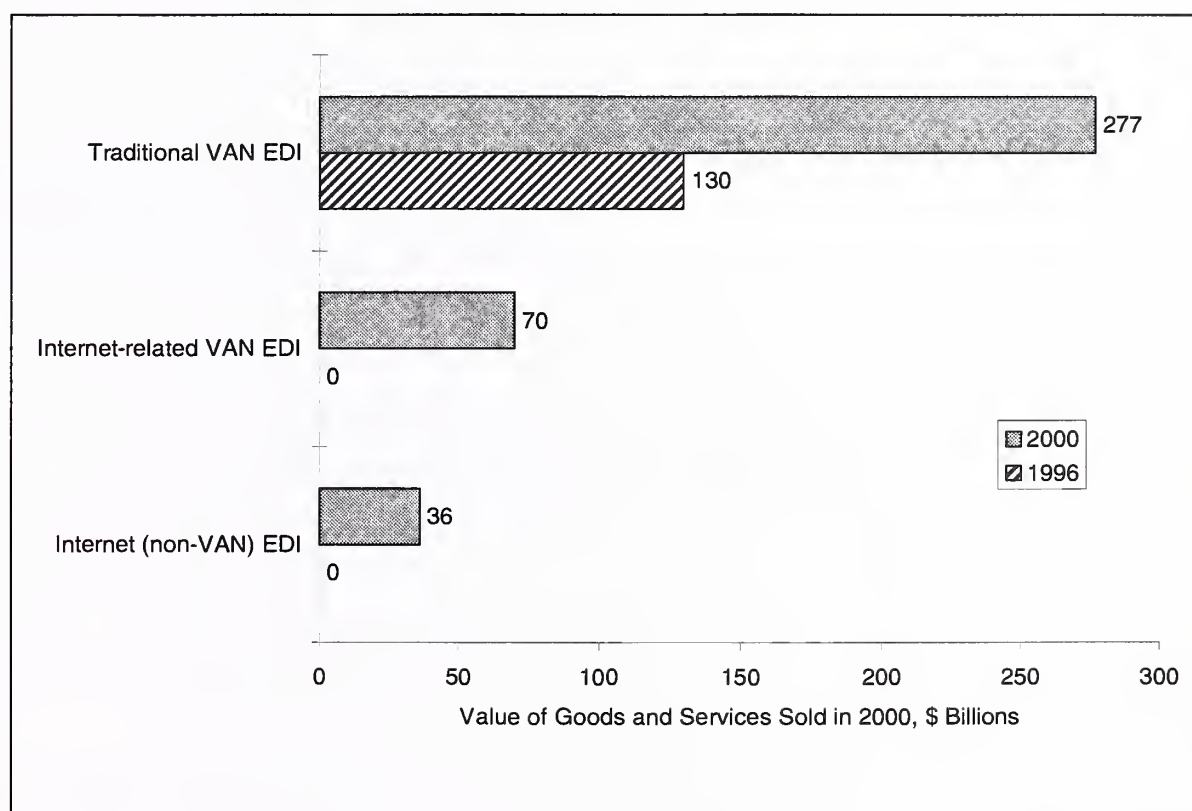
Source: INPUT

The value of goods and services sold through Internet/EDI total $106 billion in the year 2000. This a substantial figure, and fast growing at 110% per year. However, it is still only about 40% of the value of sales made through the traditional VAN channel. This is consistent with INPUT's research findings that users see a high value in the "value-added" aspect of VANs' services.

INPUT projects that as the Internet puts pressure on VAN charges to decrease, and Internet charges increase, the Internet will no longer be seen as "free."

The non-VAN-related sales are significantly lower than the VAN-related sales, consistent with INPUT's finding that most users will have an Internet/EDI strategy that co-exists with their VAN usage.

2. Value of Goods and Services Traded Using the WWW

Exhibit II-4 shows the worldwide value of goods and services traded using the WWW in the year 2000.

Exhibit II-4

**Value of Goods and Services Traded
Using the WWW in the Year 2000**
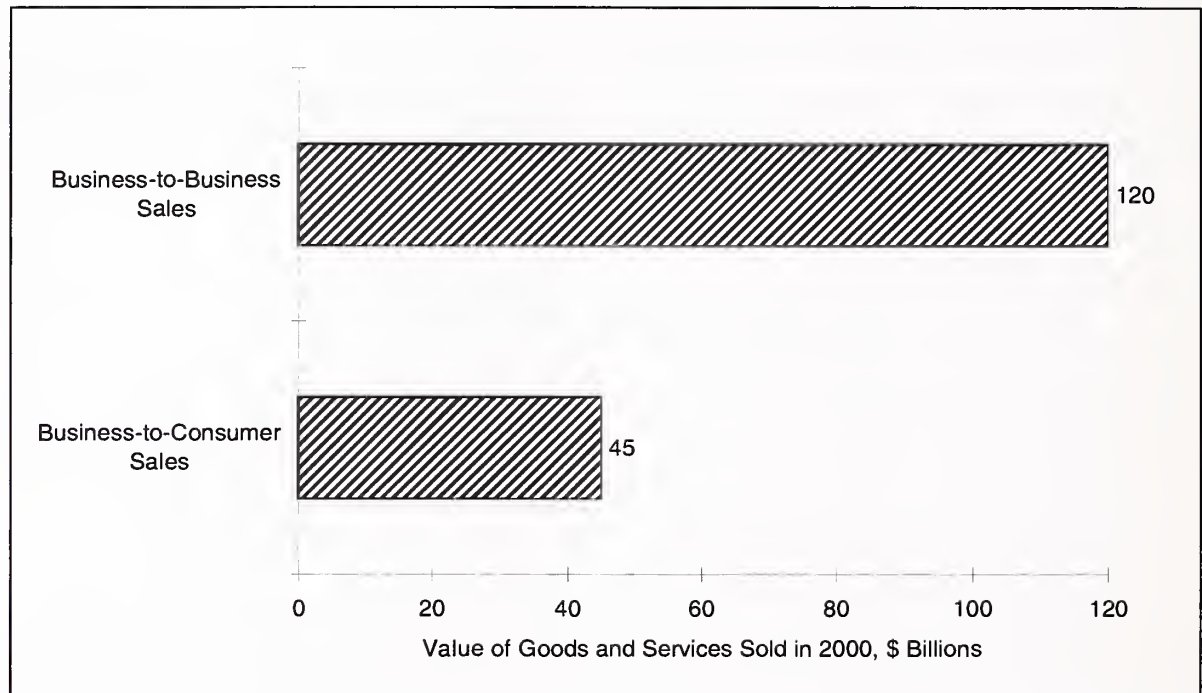
Source: INPUT

Today, business-to-consumer sales through the WWW are greater than business-to-business sales. INPUT projects a crossover within the next few years to the ratio as shown above.

The total value of goods and services sold over the WWW in 2000, at $165 billion, is about 40% of the value that will be sold through the EDI medium in 2000. However, it is growing at a much faster rate—250% per year, compared to 32% for EDI.

The total value of goods and services sold business-to-business over the Internet (EDI and WWW) is projected by INPUT to be $255 billion in the year 2000. This is a little less than 2% of the total worldwide business-to-business commerce expected in that year.

D

Current Experience of EDI Over the Internet

Although VAN Internet services are not generally available yet, and Templar users are generally still in the early stages of their implementations, there

are a number of "early adopters" that have implemented EDI over the Internet by themselves.

The most prominent are Lawrence Livermore National Laboratory (LLNL) and Bank of America, which have developed their own "standards-based" package to give completely secure communications for payments that LLNL makes to its vendors.

Other companies taking a "do-it-yourself" approach to Internet commerce are simply transmitting messages in the clear (i.e., without security). Although prudence would seem to dictate only careful and very controlled use of this approach, the experience of those who have adopted it is generally very positive.

INPUT has found that the key parameters driving companies to use the Internet without waiting for commercial packages to help them are the need for rapid communication and very high traffic levels with trading partners. The companies have determined that equivalent response time could only be obtained from a VAN architecture by the provision of very expensive private lines. The situation of companies that have implemented their own Internet solutions is not typical of the average VAN user, so we cannot conclude that their satisfaction with the Internet should cause the average user to follow the same path. However, they are certainly blazing a trail and learning lessons that will become more generally applicable as time goes on.

E

World Wide Web Commerce

A companion report, *Electronic Catalogs, Web Storefronts and Internet Malls,* studies the market and forecast for WWW commerce in great detail. This report, *Electronic Commerce Over the Internet,* investigates strategies being taken by the server and browser vendors in enabling commerce on the WWW.

"Server push" technology will allow WWW vendors to be proactive in marketing to their customers by having the server reach out to them. This is an advantage over the current situation, in which vendors must wait passively for potential customers to surf to their site.

"Persistent client-side state" browsers will allow more intelligence in the server/browser communication, as they will allow the browser to "remember" what has happened between sessions and pick up where it left off.

A major opportunity for EDI software vendors is to assist WWW server vendors in the implementation of back-end interfaces from the server to the legacy systems that support fulfillment of orders captured by the server. This is currently a manual process in most cases, and EDI technology may provide

the solution of connecting Web sites to legacy fulfillment systems (although it is also possible that the server vendors will bypass EDI technology in favor of more modern protocols attuned to the specific needs of the Internet).

F

Enabling Technologies

A major key to enabling Internet use for electronic commerce is the availability of security mechanisms. INPUT differentiates between transport security, which provides for encryption and authentication over a particular channel, and data security, which provides for end-to-end security for a complete application.

SSL and PCT are transport security protocols promoted by Netscape and Microsoft, respectively. STT and SEPP are data security protocols promoted by Microsoft/Visa and Netscape/MasterCard, respectively, that allow for security all the way from the consumer entering a credit card number into a browser, through the merchant (who cannot gain access to the number), to the credit card verification center. Many other security protocols exist, such as PEM, PGP, MOSS, S/MIME and S/HTTP, and their interrelationship is explained in Chapter VI.

Although the security arena is complex, INPUT concludes that Internet commerce can be made significantly more secure than any other form of commerce existing today. However, the technology must be applied correctly, and guidelines/good practices need to become commonplace to avoid the embarrassing security breaches that make the headlines and tend to erode confidence in the Internet as a viable tool for commerce.

Multiple, overlapping, and sometimes competing protocols threaten to slow the acceptance of Internet commerce. Based on the rate of innovation and the "open" attitude shown in the Internet community, INPUT is confident that competitors will cooperate to make their protocols interoperable.

Other technologies that will facilitate electronic commerce in a WWW environment include the ability to create more powerful applications and enliven the user interface through the application of client processing through JAVA, animation through Macromedia's Shockwave and realistic 3-D presentation to the customer through the Virtual Reality Modeling Language (VRML).

III
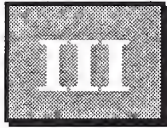
The Internet—Its Characteristics in an Electronic Commerce Environment

This chapter discusses the characteristics of the Internet and its role in electronic commerce activities. Explosive growth of the Internet, new service needs and information demands by users have presented areas of both opportunity and concern.

A
Internet Characteristics

Electronic commerce over the Internet has two major driving forces:

- Businesses are constantly striving to reduce costs. The Internet is perceived to be well positioned to assist in lowering the transaction costs that businesses currently incur with VANs.

- EDI "hubs" are large companies that are very motivated to get as many as possible of their suppliers ("spokes") to trade electronically using EDI. The Internet represents an opportunity for hubs to get more of their spokes to use EDI.

Exhibit III-1 lists characteristics of the Internet that provide a framework for electronic commerce over the Internet. These characteristics make it easy for vendors on the Internet, and trading partners using the Internet as a carrier for EDI messages, to configure software and implement strategies that support their business objectives.

Exhibit III-1

Characteristics of the Internet Today

- Wide availability
- Low cost
- Broad selection of software
- Vast amounts of information available
- Electronic mail system interconnectivity

Source: INPUT

- Wide Availability—The Internet was originally built to connect research and academic facilities worldwide. Today, it is a rare geographic location that cannot connect, in some manner, to the Internet. This wide availability has made it possible for 30 million people to communicate with each other, to access the information they want, and to purchase the goods and services they need.

- Low Cost—The essential ingredient to the Internet's wide availability has been its low cost. It is inexpensive to set up an electronic mail server or an FTP site. Once done, the server is another point on the Internet. Much user software required to access the Internet is available for little or no cost. When the barriers to use are low, a technology's acceptance into the marketplace is rapid, and this has happened to the Internet.

- Broad Selection of Software—A widely available network that is inexpensive to set up and run would still only address a small, specialized market if there were no mass-market user tools available. The personal computer revolution has created a vast pool of programming expertise around the world. The resulting widespread exchange of ideas and talent, across multiple hardware and operating system platforms, has resulted in the development of a wide array of software tools for both the user and the information server markets.

- Vast Amounts of Information Available—Just as tools have grown in sophistication and ease of use, the volume and types of information available on the Internet have also grown. Not only has static, bibliographic-style information become more common, but dynamic

information such as weather reports, stock market information, and descriptions of products in malls has also increased. INPUT's report *Electronic Catalogs, Web Storefronts and Internet Malls* goes into more detail on this topic.

- Electronic Mail Interconnectivity—Fundamental to the Internet's explosive growth has been its ability to interconnect disparate electronic mail systems. As long as proprietary E-mail systems adhere to the Internet standard, any user can communicate with another user, worldwide. No longer is it necessary to figure out the convoluted X.400 E-mail address of your colleague. Ease of interconnection has the benefit of lowering the costs related to doing business on the Internet.

B
Current Internet Issues

Exhibit III-2 lists four issues that affect electronic commerce over the Internet. Although these issues are being addressed by ISPs (Internet service providers) and the IETF (Internet Engineering Task Force), they have not yet been eliminated and must be worked around in the short term. When the current draft discussion stage of the IETF is completed, supportable standards will be in place. With these in hand, it will be easier and more profitable for organizations to invest in Internet electronic commerce services.

Exhibit III-2

Current Issues of the Internet

- Insufficient bandwidth
- Uncertainty of delivery
- Authorization and authentication of payments
- Message privacy and integrity

Source: INPUT

- Insufficient Bandwidth—With the number of users and information transfer volumes rising exponentially, the pipelines that carry these demands are overcrowded. The growth of the Internet's popularity has outstripped the carriers' ability to upgrade the capacity of the network on a timely basis. This affects the ability of users to get at information they need, and to transfer large data files. The new audio, video, and interactive technologies will make even more severe demands on the network's performance.

  ISPs and the major network carriers are actively upgrading the backbone that supports the Internet. A new generation of routers, combined with high-speed ATM switches, is progressively resolving the bandwidth restrictions.

- Uncertainty of Delivery—In the Internet environment, actual delivery of a message or transaction file is not always assured. This is because of the current underlying network architecture. A message's packets can follow different routes to the destination because the Internet is a collection of interlinked networks, servers and carriers. If one of the servers or carriers is down, then that message will be incomplete and must be resent.

  The IETF has in its draft standards cycle a proposal to upgrade the SMTP protocol to provide for an acknowledgment capability. Such capability is present in many of the private E-mail systems, such as AT&T EasyLink Mail and IBM's Lotus division's cc:Mail.

- Authorization and Authentication of Payments—Electronic commerce over the Internet will grow more rapidly once there are mechanisms routinely in place whereby sensitive, payment-related data can be secured before being submitted to the Internet for delivery. The securing of the information in a standardized manner provides the receiver with the assurance that the payment instruction is authorized and authentic.

  Currently, there are two proposed approaches to ensuring this level of security: Secure Transaction Technology (STT) from Microsoft and Visa, and Secure Electronic Payment Protocol (SEPP) from Netscape and MasterCard. The uncertainty as to which proposal will prevail prevents software suppliers and business planners from making definite implementation plans.

- Message Privacy and Integrity—The contents of the electronic commerce message are often sensitive as well. For this level of security, there are three competing approaches: Secure HTTP (SHTTP) from Terisa, Secure Sockets Layer (SSL) from Netscape and Private Communications Technology (PCT) from Microsoft. Only SSL is used widely at this time through the Netscape browser.

Widespread expansion of electronic commerce over the Internet demands interoperable standards. Interoperable standards give developers and vendors confidence that they may gain a return on their product development costs.

C
Summary

The growth and wide accessibility of the Internet has created an unprecedented marketplace opportunity for sellers and marketers. While several issues have been raised, solutions have also been identified. The remaining work to be done is to reconcile the competing proposals and implement the solutions. These processes will reach completion as 1996 progresses.

With the solutions about to be standardized, businesses should not be in a "wait and see" mode. Business organizations should be reviewing their objectives and goals for Internet electronic commerce. They should then consider implementing pilot systems and trials to understand which capabilities support their organizations most effectively. The capabilities of the Internet will allow them to enhance their positions in the electronic commerce marketplace, and to generate additional revenue flows. In some industry segments, companies that fail to embrace Internet commerce are at significant risk of losing business to their competitors that can trade electronically.

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IV

EDI Over the Internet

Historically, the VANs have provided major corporations (hubs) with the transport capability to exchange EDI standard documents with their trading partners (spokes). The VANs do this by using mainframe-based store and forward systems that collect data sent in by trading partners, and then distributing the messages to the appropriate mailboxes based upon the address information stored in the message. This service is based on well-established technologies and presents no particular technical challenges to VANs. Other services, such as ensuring confidentiality of transmission, delivery assurance, audit trails and trading partner roll-out assistance, give the VANs the added value they believe users desire and are willing to pay for.

Originally, the Appropriate Use policy for the Internet restricted commercial use, academic and research pursuits being its main applications. Now, with the broader interpretation of the Appropriate Use policy of the Internet, it has become feasible to implement commercially oriented activities, such as EDI, over the Internet.

This chapter reviews the impact that the Internet is having on the strategies of the EDI VANs and the EDI translation software vendors. It also includes the results of a survey of EDI VAN users, their opinions about the VANs they use and the effect that these opinions have on the possibility of using the Internet for EDI. The chapter concludes with a review of current Internet-based EDI initiatives.

A
Users of Value-Added Networks

1. Respondent Profile

It is often stated that VANs are hard to use and are expensive. This view is sometimes expressed to explain the slow expansion of EDI. For this report, INPUT interviewed users who subscribe to VANs such as GEIS, AT&T, Harbinger and COMMERCE:Network from Sterling. The objective of the survey was to ascertain the level of satisfaction the users have with their VAN providers. A high level of dissatisfaction would identify a situation in which users would be more inclined to consider moving away from the VAN onto the Internet when the possibility presents itself.

2. Importance of VANs' Value-Added Services

Exhibit IV-1 shows how users rate the various VAN services to which they subscribe. It is evident that the value-added services, such as assistance with trading partner implementation, customer support, conversion from EDI to other formats, etc., rate higher even than the basic service of EDI message exchange. INPUT concludes that these value-added services would be missed if the Internet were to be used for basic EDI message exchange.

Exhibit IV-1

Importance of VANs' Value-Added Services

Service	Rating
Support	4.5
Connectivity to Trading Partners (same VAN)	4.4
Connectivity to Trading Partners (other VANs)	4.0
Trading Partner Implementations	3.6
Conversion Services (EDI to Fax of U.S. Mail)	3.0
EDI Message Exchange	2.7

Rating
(1=Very Unimportant to 5=Very Important)
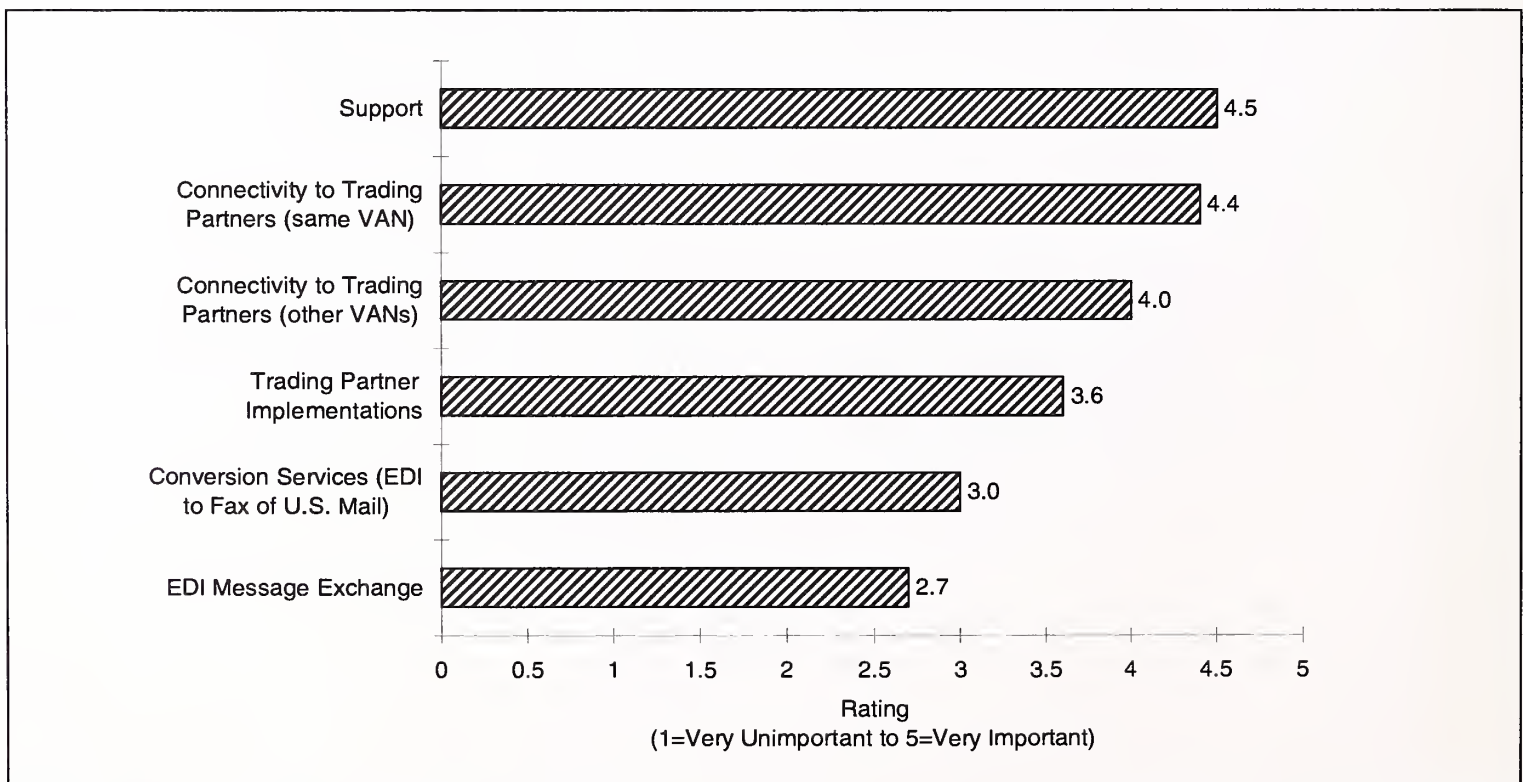
Source: INPUT

3.   Importance of VAN Characteristics

There are four key characteristics of the services offered by VANs:

- Authentication - the process which assures the receiver that the message did indeed come from the indicated sender

- Integrity - the receiver's confidence that the message was not altered after it was sent

- Non-repudiation - the assurance that the sender cannot deny having submitted the EDI message to the network

- Confidentiality - the assurance that the message was not viewed by third parties before it was delivered to the receiver

Users were asked how much they valued each of these characteristics, and the results are shown in Exhibit IV-2. It is striking to note that all of these characteristics were valued very highly (all above 4.0). Users fully understand the value of subscribing to VANs and would expect to see these characteristics in any alternative EDI network strategy, such as the Internet.

Exhibit IV-2

Importance of VAN Characteristics

Rating
(1=Not Important to 5=Very Important)
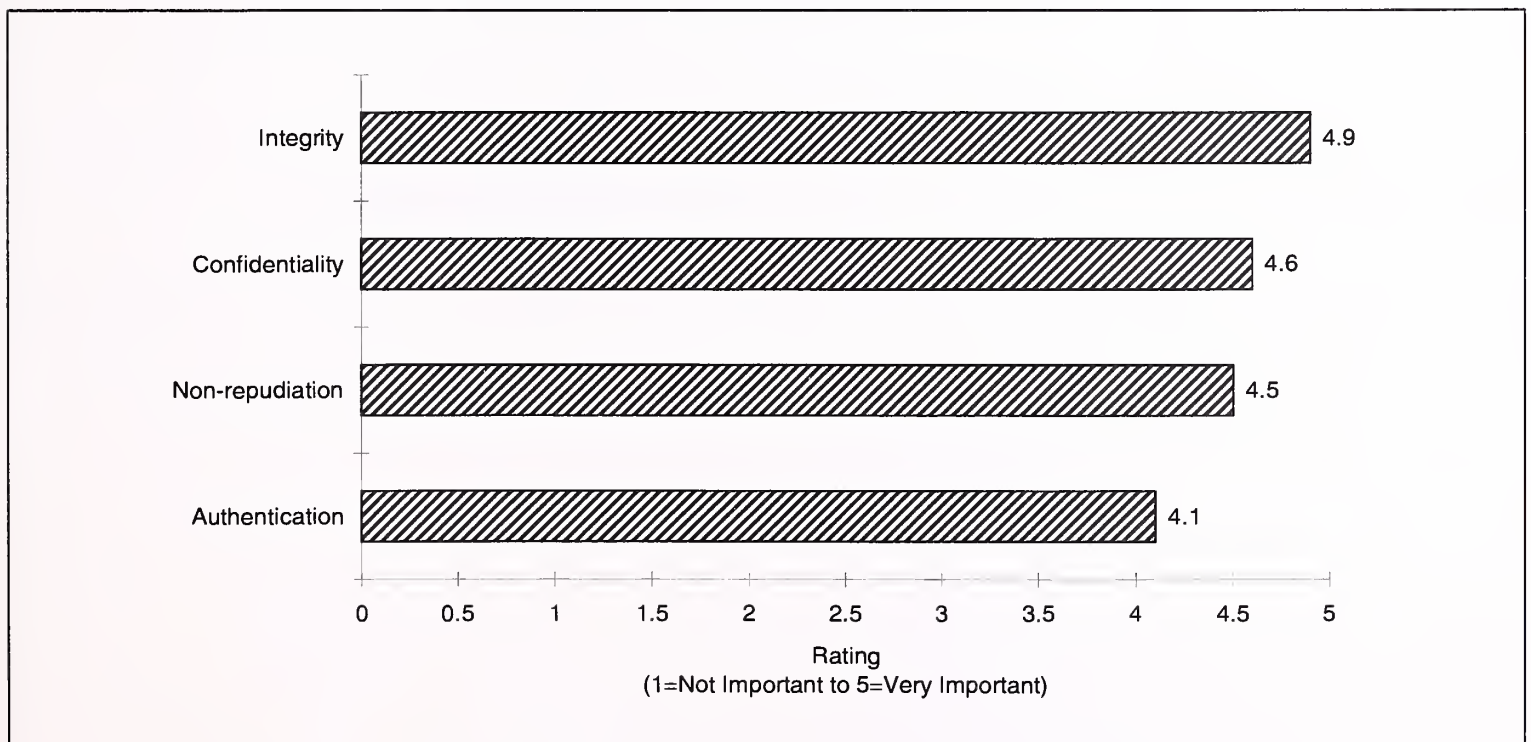
Source: INPUT

4. Evaluation of VANs

a. Level of Satisfaction About Expenditures

Exhibit IV-3 shows the user perceptions regarding VAN costs. Over 60% of users rated their level of expenditures on VANs to be "Somewhat Reasonable" or "Very Reasonable." It is significant that no users determined their costs to be "Very Unreasonable." Even if users believe that VAN costs are high, they understand that they are getting needed value from fees paid.

Exhibit IV-3

User Perceptions of VAN Costs
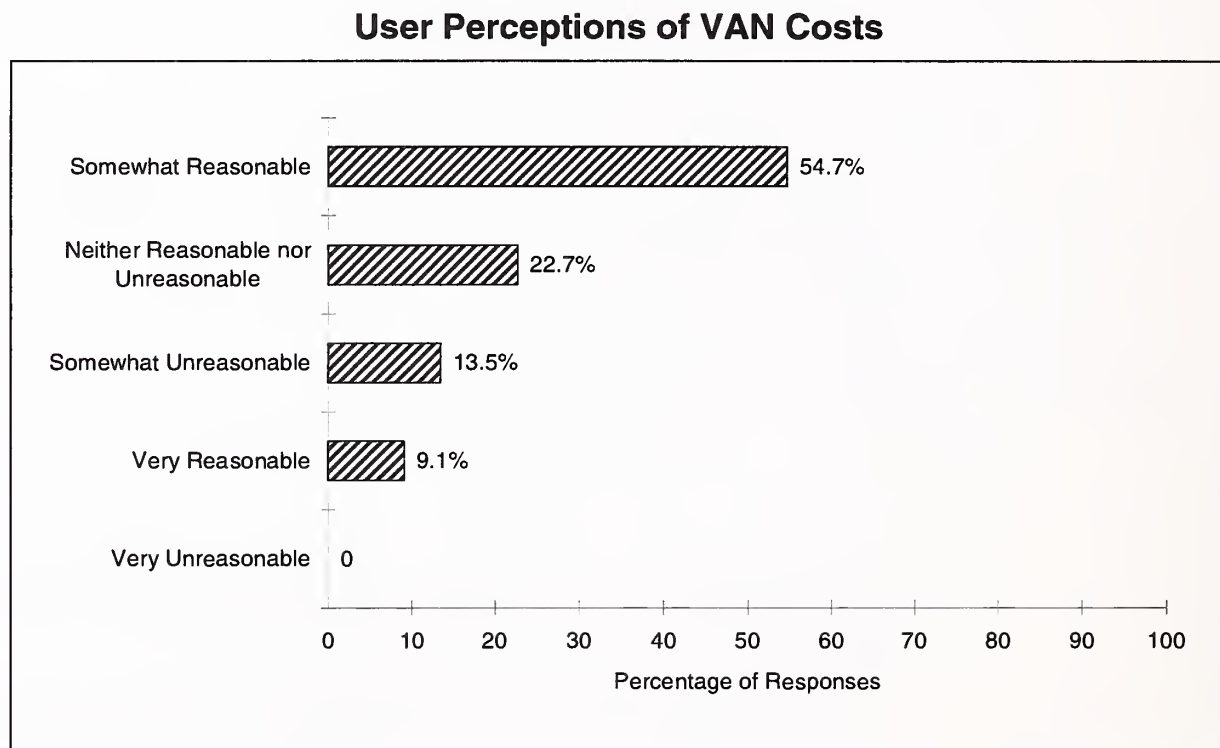
Source: INPUT

b. VAN Characteristics Important to Users

Exhibit IV-4 shows how users responded when asked which characteristics of VANs were most important to them. Reliability and ease of use were the most important factors. Nobody mentioned low prices as the most important characteristic. Users appreciate the value-added services of VANs more than they dislike VAN costs.

Exhibit IV-4

VAN Characteristics Important to Users

Bar chart titled "VAN Characteristics Important to Users" showing Percentage of Responses:
- Ease of Use: 32%
- Reliability: 32%
- Support: 16%
- Trading Partner Implementation: 16%
- Rapid Delivery: 4%
- Low Prices: 0
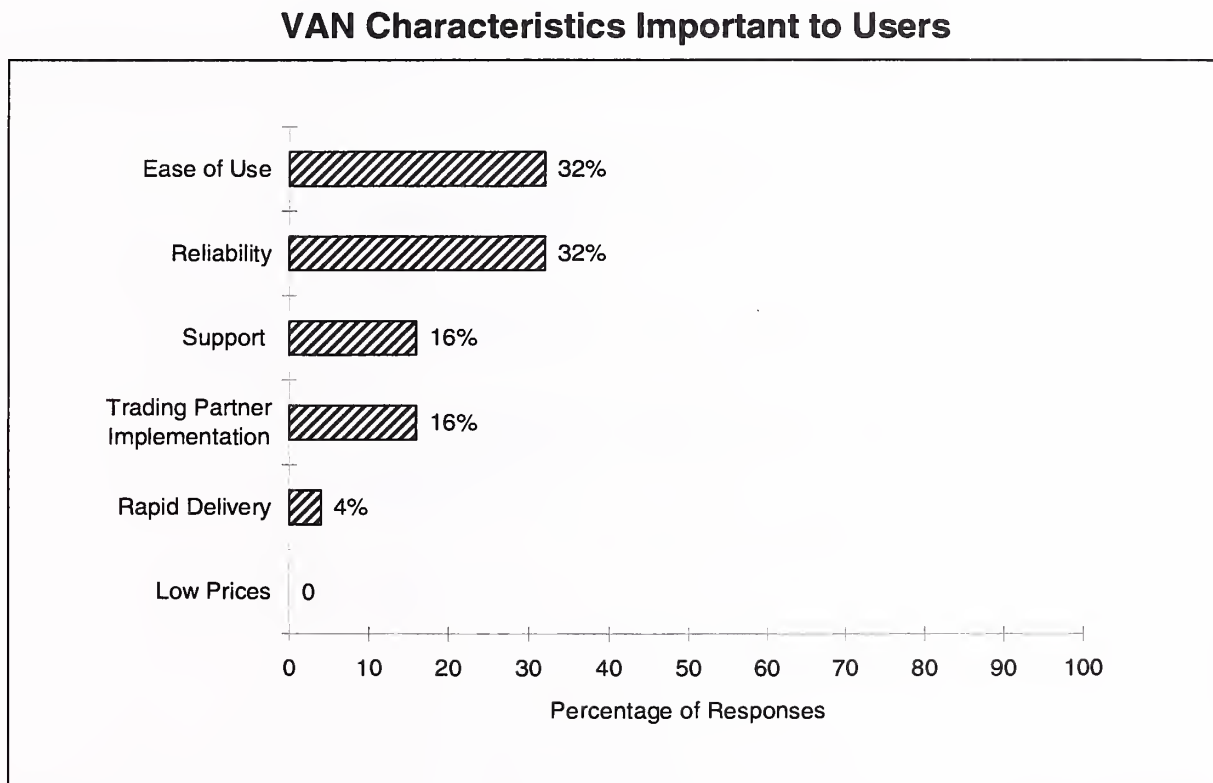
Source: INPUT

c.   Overall Satisfaction With VANs

As Exhibit IV-5 shows, VAN users have a very high level of overall satisfaction with their VANs. Over 80% of users are at least "Somewhat Satisfied" with VANs. It is significant that none of the users selected either "Somewhat Dissatisfied" or "Very Dissatisfied" satisfaction levels. VAN users will not easily migrate away from the VANs without a significant inducement.

Exhibit IV-5

Overall Satisfaction Level with VANs
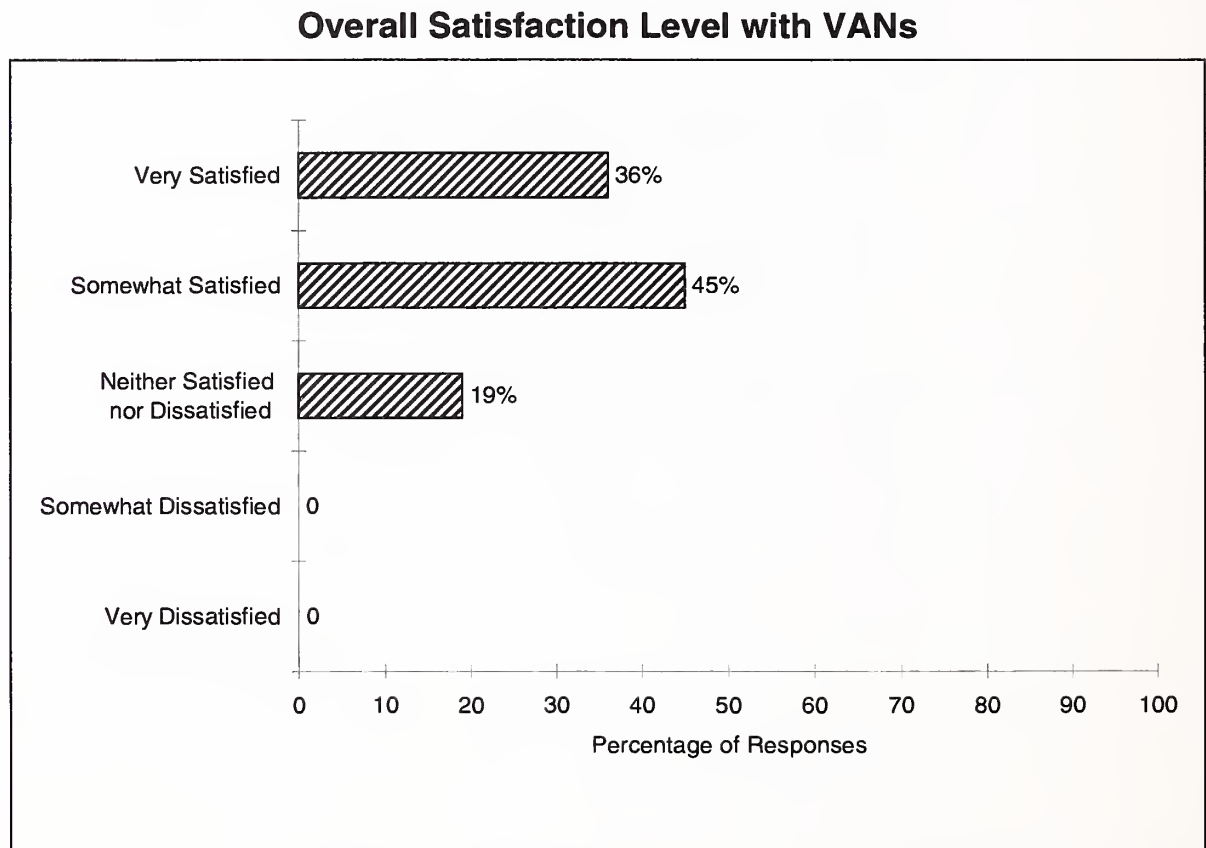
Source: INPUT

5. Current User Plans for the Internet

a. Likelihood of Using the Internet for EDI

VAN-EDI users were asked about their current intention to use the Internet as an alternative to the VAN. Exhibit IV-6 indicates that there is no strong momentum to use the Internet for EDI.

Exhibit IV-6

Likelihood of Using the Internet for EDI
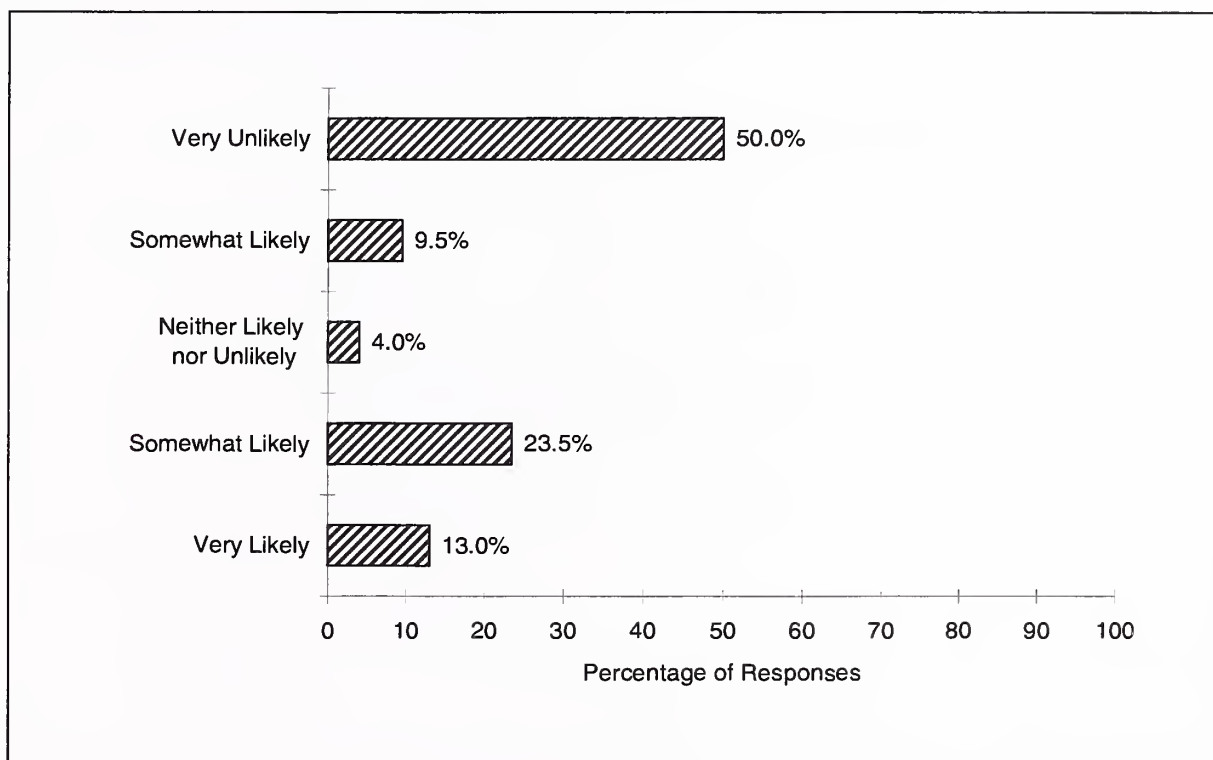
Source: INPUT

b. Reasons for Not Using the Internet

Exhibit IV-7 shows that among the VAN users who indicated that they would not use the Internet for EDI, the strongest reason is the Internet's perceived lack of security.

Exhibit IV-7

Reasons for Not Using the Internet for EDI
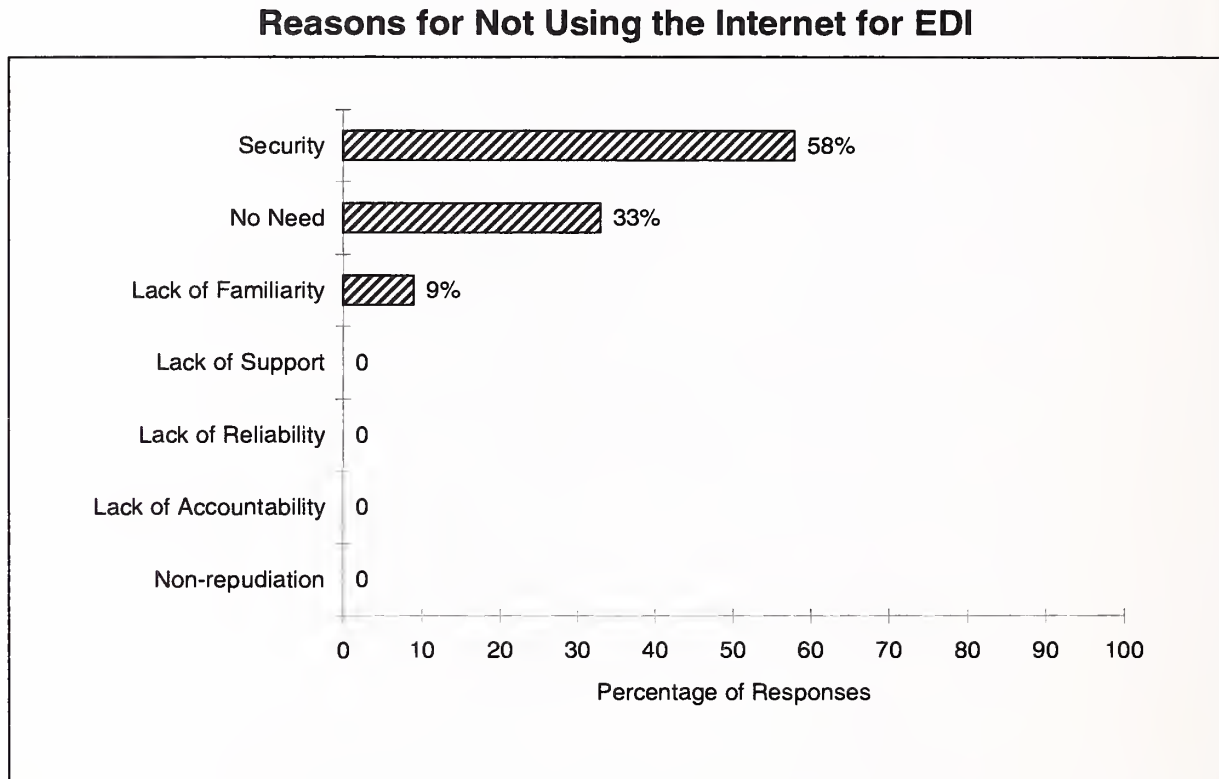
Source: INPUT

INPUT concludes that the reason for this is that users do not yet understand that there are solutions at hand for solving the perceived security risks. As users come to understand this, INPUT believes that this issue will go away, and users will be much more amenable to considering the Internet an alternative to VANs.

c.   Likelihood of Continuing to Use a VAN

Of the users who expressed an interest in using the Internet, Exhibit IV-8 shows those respondents' evaluation of the likelihood that they would continue to use their VAN. It appears that users would look upon the Internet as a complementary service to the VAN they currently use for exchanging EDI, rather than as an outright replacement. However, the fact that over 50% of respondents were indifferent or somewhat unlikely to continue using a VAN indicates an opportunity for software and value-added Internet service providers (ISPs) to make VAN users migrate to the Internet.

Exhibit IV-8

Likelihood of Continuing to Use a VAN
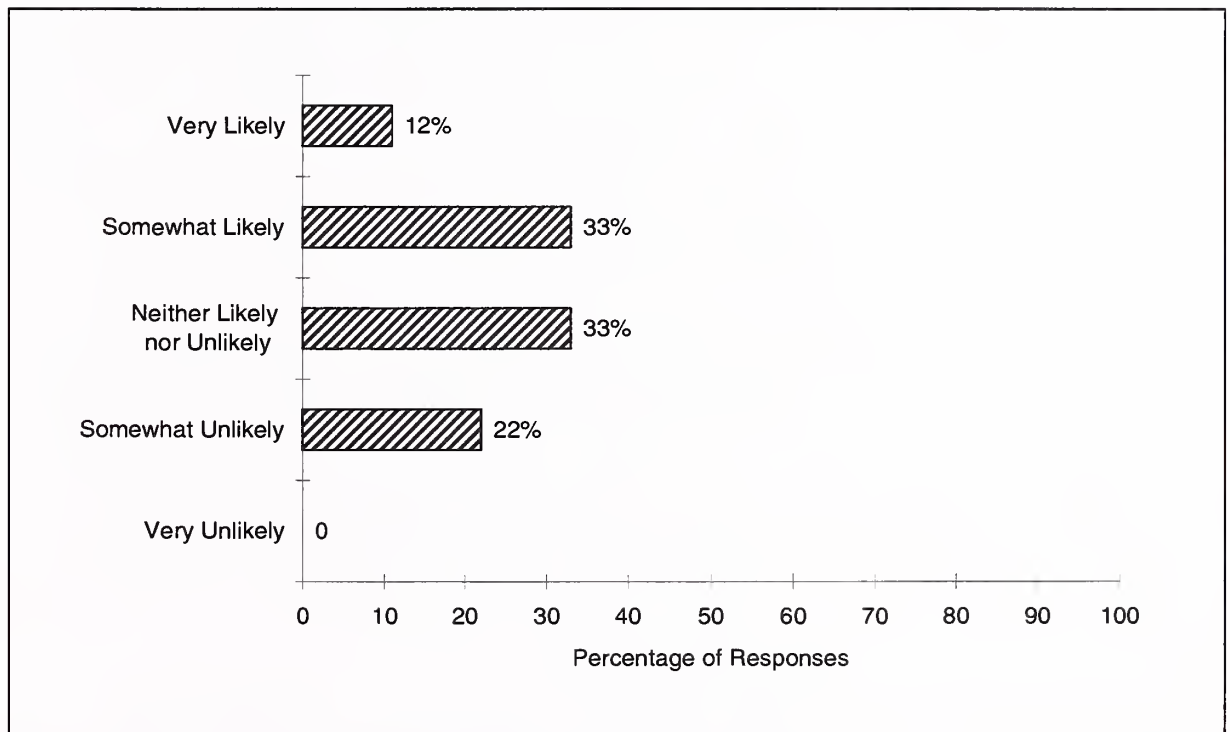
Source: INPUT

d.   Expected Cost Savings of Using the Internet for EDI

Whether or not users currently plan to use the Internet for EDI, Exhibit IV-9 shows that they would expect to save about 10% to 20% on EDI transaction costs. This expectation would not be satisfied for users on VANs that adopt an EDI/Internet strategy that does not reduce user cost, e.g., Sterling's COMMERCE:Network (see section B.3.b).

Exhibit IV-9

Expected Cost Savings of Using the Internet
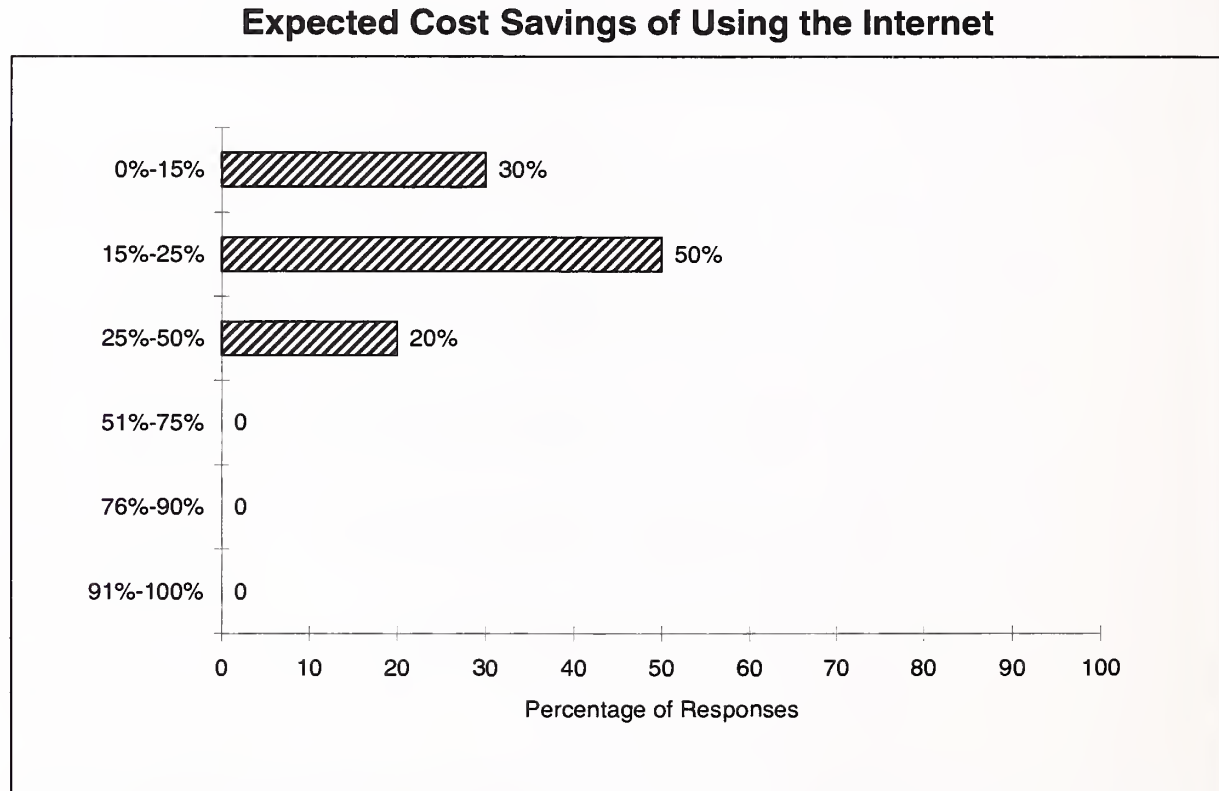
Source: INPUT

6.   Conclusion

Based on this survey, INPUT concludes that users understand that they are receiving valuable services from the VANs over and above the basic EDI message service, and that they are paying accordingly. Users do not appear to find their costs out of line, and they are satisfied with the VANs. Although they are aware of the Internet, users have no pressing desire to move away from VANs at this time.

INPUT believes that as the security issues are seen to be resolved, users will come to consider the Internet in a more favorable light, and could decide to use it as a service complementary to their VAN services. The larger and more sophisticated users are already aware of the potential of the Internet to securely complement VAN services and are pushing for VAN/Internet strategies accordingly.

B
Value Added Networks

1. Business Environment

The low-cost nature of the Internet has attracted the attention of many organizations that are examining how they can best address the two primary objectives of hubs regarding EDI:

- Expand the number of trading partners with whom they transact EDI

- Implement new applications of the EDI standard

Regarding the first objective, many small trading partners (spokes) targeted by the hubs believe they cannot afford to do EDI through the VANs at the minimal transaction volumes involved—VAN fixed costs are too high for them. Using the Internet, however, reduces these fixed and transactional costs significantly for the smaller trading partner.

Concerning the second objective, the new applications of EDI standards are oriented toward time-sensitive, high-volume data transmissions, such as service repair orders, health claims, etc. VAN pricing schedules are structured toward low volumes that are not time-sensitive. In effect, the store and forward technology that VANs use is inappropriate for use in time-sensitive, high-volume applications. The Internet is wellsuited to supporting time-sensitive applications. Additionally, large volumes of data cost little because the Internet pricing model is oriented to time usage rather than file size.

2. Hub Demands

INPUT has found that the principal source of demand for a VAN strategy for Internet connectivity comes from the VAN hub community. The interest is strong enough that these hubs are asking VANs such as GEIS, AT&T, Advantis, and Harbinger to assist them in developing credible strategies.

For example, GEIS indicates that it is called frequently by its customersabout this matter, and AT&T has found from its focus groups that 65% of its 1-800 customer base will use the Internet services when they are offered. The principal reason for this interest is customers' desire to enlarge their trading partner base.

One of the primary frustrations of the large hubs has been the difficulty of increasing the number of trading partners. Various strategies have been attempted in the past, including massive roll-out programs, cost subsidization, periodic training and information sessions. The hubs perceive

that the Internet, with its open architecture, broad availability, and lower costs, will give them the tool they need to draw in more trading partners.

To draw in these additional trading partners, the hubs have an interest in working with the trading partner implementation services offered by the VANs. The choice of this strategy is supported by the user survey in section A of this chapter, Exhibits IV-1 and IV-4, which show that trading partner implementation assistance is an important feature of VAN services.

3.   VAN Internet/EDI Strategies

For this report, INPUT interviewed the six VANs listed in Exhibit IV-10.

Exhibit IV-10

VANs Implementing Internet Strategies

- IBM Global Network / Advantis
- AT&T EasyLink
- Sterling Commerce:Network
- Harbinger Net Services
- GEIS
- Kleinschmidt

Source :INPUT

Each VAN has a strategy to meet the hubs' requests for Internet services. These strategies are categorized into three groups as follows:

- On-demand connectivity

- Controlled connectivity

- Open connectivity

a.   On-Demand Connectivity

- In the first VAN strategy, which we call "on-demand connectivity," the VAN has no specific service offering for its user community vis-à-vis the Internet. While the VAN has a connection to the Internet, it is not robust, and it is not actively marketed. VANs in this category have seen little demand for a connectivity service and they do not see the benefit of offering such connectivity in advance of such demand. An example of a VAN in this category is Kleinschmidt.

- INPUT expects VANs in this category to feel the pressure from their customers as they see the competitive offerings, and that VANs in this category will soon adopt a more proactive strategy. INPUT believes that a VAN pursuing this strategy long term may diminish its chances of benefiting from a significant business opportunity.

b. Controlled Connectivity

- An example of the next strategy, "controlled connectivity," is the that offering implemented by Sterling's COMMERCE:Network services in initial offering. Under this strategy, the VAN allows the Internet to be used as another means of accessing its central data center, which is exclusively used to route all EDI message traffic. The EDI messages are contained in secure files that are transferred via the FTP protocol.

- To implement this strategy, the VAN provides VAN-specific software that will tunnel through the Internet to the VAN's data center, as illustrated in Exhibit IV-11. In this exhibit, the Internet-connected trading partner is using software provided by the VAN. This software is configured solely for the purpose of using the Internet in a manner similar to a dial-in line. It uses a secure FTP session to establish a link with the data center's firewall and gateway, and through that, with the EDI messaging software. Because the VAN provided the software that the customer is using, it is able to impose a message security approach that is specific to its needs. In this controlled environment, issues such as key generation and key administration are not addressed, because the VAN controls all parts of the transmission cycle. The data center does not support the SMTP protocols normally associated with Internet EDI, and MIME attachments are not needed.

Exhibit IV-11

**Alternate Ways of Accessing Trading Partners
with Controlled Connectivity**
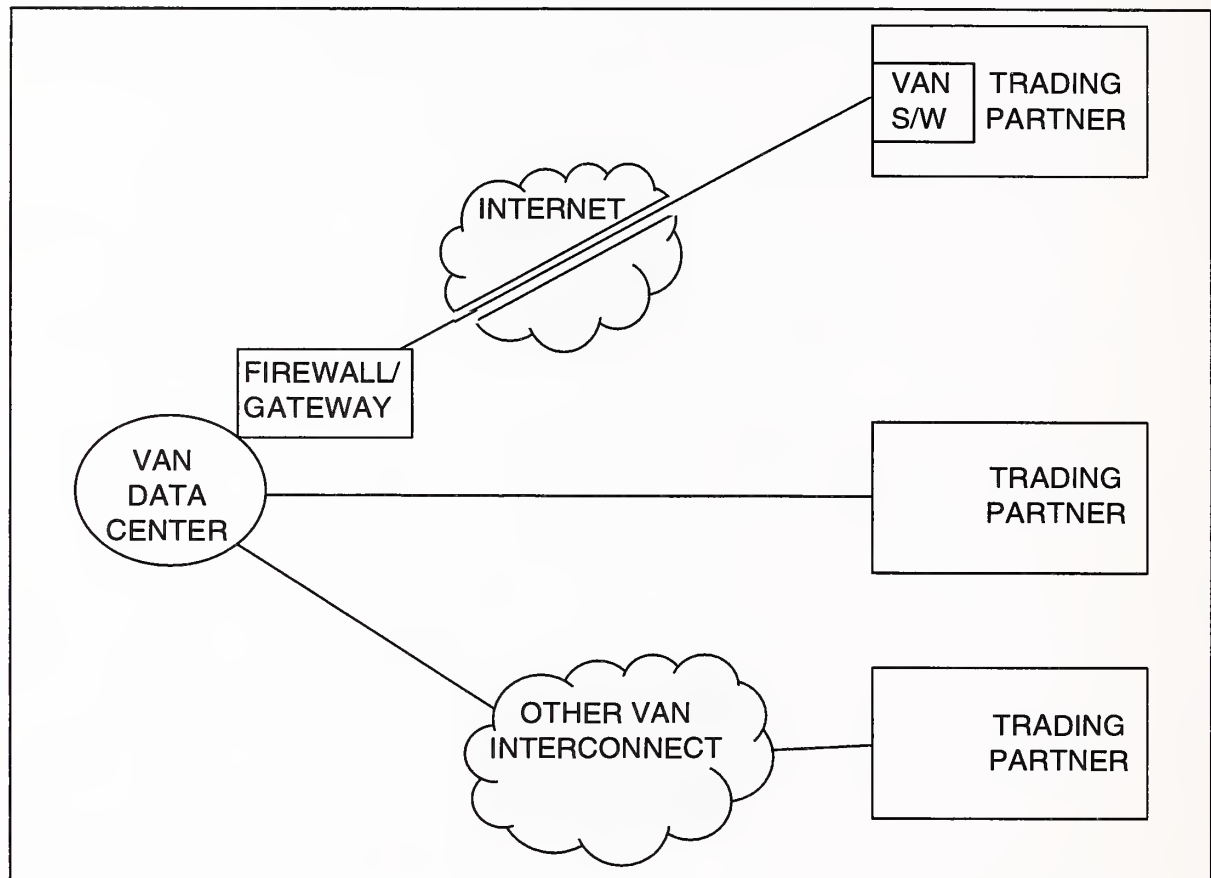
Source: INPUT

- To acquire the software and be able to use these VAN services, the user contracts with the VAN in the same manner as a regular VAN user. Thus, the pricing of the services to the user will be the same as if the client were using one of the other dial-in network options currently available.

- This strategy does not address the small and medium-sized businesses, problem of the cost of EDI over VANs. As noted earlier, this has been an inhibitor to expanding the number of EDI trading partners.

c. Open Connectivity

- The most proactive strategy, "open connectivity," is offered by such VANs as AT&T EasyLink, Harbinger Net Services, and Advantis. In this strategy, the Internet is used as the underlying transport, instead of, or in parallel with, the VAN's own network. By implementing standard Internet protocols, the VAN can exchange EDI messages over the Internet. Trading partners on the Internet become an expansion of the entire EDI marketplace. The VANs implementing this strategy are working on the premise that there will always be growth in VAN-based EDI traffic, but that extensive expansion will occur on the Internet.

- To encourage that growth, these VANs are racing to develop and license software that can be customized to handle EDI messages for either VAN-based or Internet-based trading partners. This software handles the security of the data, as well as enveloping the message so that it can be delivered according to the SMTP protocol specification.

- In contrast with the Controlled Connectivity option which uses a file transfer methodology (FTP), this strategy supports standard E-mail SMTP and MIME protocols. The gateway in Exhibit IV-12 is installed to support message-level interconnectivity between the Internet and the VAN. Because the message originated on the Internet, and the gateway's IP address can be known to anyone, security software is installed in the gateway to manage the security envelope that surrounds the EDI message. This management function handles the security of the EDI messages, as well as message file encapsulation (SMTP or MIME) compatibility for the Internet. It is at this gateway point that the VANs intend to administrate the keys required for this cryptographic process, although no details have been released as to how this will be accomplished.

Exhibit IV-12

Alternate Ways of Accessing Trading Partners with Open Connectivity
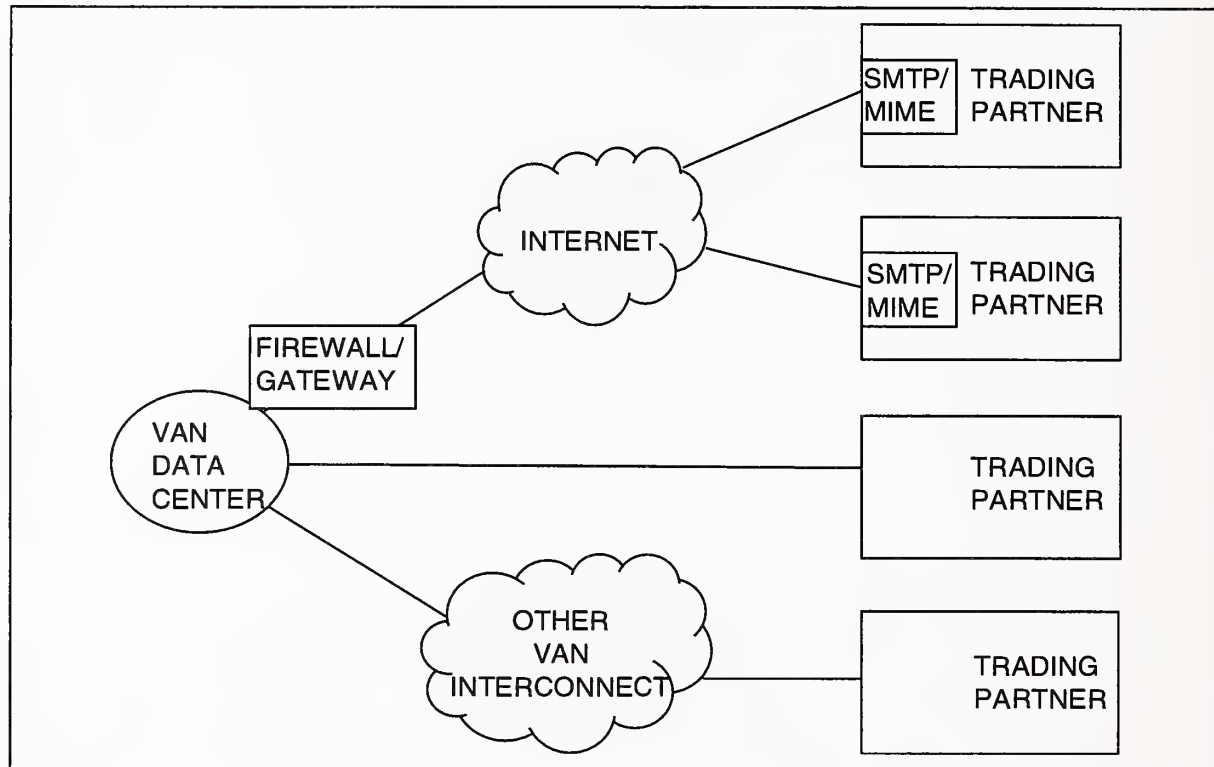
Source: INPUT

Importantly, this strategy does not restrict the Internet-based customer solely to exchanging EDI messages via the VAN's data center. The software options provided include the capability—that is, SMTP and MIME support— to use the Internet as the carrier of EDI messages to trading partners set up to receive the messages via the Internet. (As of today, there is no commercially available package, other than from the VAN, to communicate with the VAN's SMTP/MIME implementation, but the use of these open protocols will make that easier in the future.) In this way, data and message exchanges that do not require the assurance of the value-added services of a VAN can be sent over the Internet, while those that do can be sent to the VAN's data center.

The strength of this strategy lies in its adherence to open E-mail standards and the fact that it does not matter to the VAN data center what software the trading partner uses for EDI, or to access the Internet. The trading partner needs only concern itself with the Internet address of the VAN data center. This is in contrast to the controlled connectivity option, where the user must use the software supplied by the VAN.

Another component of this strategy is the implementation of a gateway to the Internet that provides the security procedures and firewall software to safeguard VANs' networks from unauthorized access. None of the

announcements to date have explained whether, or how, the VANs intend to charge for this Internet gateway service.

Exhibit IV-13 summarizes the strategies the surveyed VANs intend to follow.

Exhibit IV-13

VAN Strategies for the Internet

Strategy	Description	Strength	Weakness	VAN
On-Demand Connectivity	No specific service aligned with the Internet	Minimizes the security threat to the network's user base	Ignores the growth potential of attracting new trading partners	Kleinschmidt
Controlled Connectivity	Users securely connect to VAN data center via the Internet	Provides the strong security and confidence of a closed user group	Does not address cost concerns of small/medium-sized enterprises	Sterling GE InterBusiness
Open Connectivity	Users connect with the VAN network using SMTP/MIME	Provides users with business solutions, while accessing the existing value-added services	Pricing structure for the Web gateway service is unknown	IBM Global Network Harbinger

Source INPUT

4. VAN Strategy Descriptions

a. Kleinschmidt

Kleinschmidt's Internet strategy, consistent with its overall services approach, is that it does not expend energies developing new services in advance of specific requests from clients. Rather, Kleinschmidt responds to client requests, and clients have not yet demanded Internet connectivity.

Kleinschmidt notes that fewer than 10 companies are currently trading more than 50 transactions per month over the Internet. Though this rate has been increasing over the last six months, Kleinschmidt does not expect significant growth during 1996.

In light of the user survey reviewed in section A, this strategy would appear to be in line with the stated intention of the majority of the users who view using the Internet for EDI as unlikely for their organizations.

However, the user survey did indicate that EDI users are interested in the Internet as a complementary service/strategy to their VANs. Therefore, it would appear that a VAN would want to be in a position to respond to this growing interest.

b. Sterling COMMERCE:Network

Sterling COMMERCE:Network believes that trading partners do not have a strong desire to exchange EDI messages without the value-added services available through a VAN. In part because Sterling does not have its own communications network like other VANs, it is treating the Internet as another data line into its data center. Thus, Sterling is configuring specific software to dial out to the Internet and communicate directly via the File transfer protocol (FTP) with the data center. As with Sterling's current dial-in options, this session would be secure. This secure implementation of FTP is based on Sterling Software's Dataguard software for mainframe and UNIX environments, and on VEIL for Windows-based PC systems.

The announced strategy includes support for companies that wish to exchange EDI messages, via the Internet, directly with other companies that are also on the Internet. To do so, though, requires both of the trading partners to have the same software, The EC Gateway, installed. This is because of the proprietary security approach and the use of the FTP standard to transmit files. This approach does not use SMTP or the MIME/EDI capability; however, Sterling has announced that support for these standards could become available during 1996.

In order to communicate with the data center, user organizations will have to be in a contractual relationship with Sterling's COMMERCE:Network. Sterling's strategy can be summarized as offering electronic commerce solutions that are related to its central service offering, COMMERCE:Network. This network strategy appears to be in line with those users identified in A who are concerned about the security of the Internet. By addressing this issue, Sterling's COMMERCE:Network offering provides those users with a secure means of using the Internet. This usage, however, is within the context of the traditional VAN-based message exchange framework, that being a closed, secure network. At this time, Sterling reports no commercial Internet/EDI activity.

c. GEIS with the Microsoft Network

A different approach to the controlled connectivity strategy is the GEIS - Microsoft Network (MSN) effort. MSN is building a bridge to the GEIS electronic data interchange network. Via this bridge, the MSN small business subscriber will be able to view a list of GEIS EDI clients, register electronically to exchange EDI messages, and then download the required purchase order or invoice scripts for use within Windows 95 and Microsoft Exchange. (MS-Exchange is Microsoft's new e-mail server.) How the user pays for this service has not been outlined yet. When the EDI message arrives at GEIS' Internet gateway, GEIS strips it of any Internet enveloping and returns the EDI message to its native format. To support Internet#EDI, GEIS is developing a Secure the Internet EDI offering to secure EDI

messages being sent over the Internet. Currently, GEIS is experiencing a low level of Internet transmissions fewer than 10 companies. In February, 1996, GEIS is due to announce a more general Internet strategy called GE InterBusiness.

d. Harbinger Net Services

Harbinger Net Services (a joint venture between Harbinger Corp. and BellSouth) has been active over the past six months working with a small group of hubs and customers in testing the Internet and its capabilities for EDI traffic. It has formally announced that it will expand its trading partner management program in support of its hubs by offering Internet-based solutions for their trading partners. Harbinger's approach is to treat the Internet as simply another network service to connect with. Harbinger will provide software and communications services that support SMTP/MIME and open security standards. With this software, trading partners can use the Internet to send and receive EDI transaction sets. Although Harbinger's specification uses open protocols, there is not yet any commercially available product that will intercommunicate with Harbinger's implementation.

Currently, Harbinger reports that fewer than 10 companies are exchanging EDI over the Internet. The volumes are estimated to be between 100 and 500 interchanges per month.

e. AT&T

AT&T EasyLink Services is planning on consolidating its various on-line services and creating a common hosting and transaction platform for those services. Renamed as EasyCommerce Services, it will act as a hosting platform for EDI and electronic commerce. While a complete announcement of policy is expected early in 1996, AT&T EasyCommerce intends to provide integrated EDI capability and clearance of payment transactions in the latter part of 1996.

f. Advantis/IBM Global Network

IBM is positioning its Global Network (of which Advantis is the U.S. provider) as providing global access. It will connect customers through its network to the Internet. Advantis' Internet-oriented services are called the IBM Internet Connection. During 1996, IBM will be deploying EDI— compatible services that will support the SMTP/MIME protocols. IBM has targeted the small and medium-sized business community for the initial thrust of this service offering by establishing a software integration services group.

Two distinguishing characteristics of the IBM and AT&T offerings are that they offer continuous, worldwide support and they are focused on helping

resolve the challenge of integrating a company's Internet presence with its back-end legacy systems.

5. Market Forecast

Exhibit IV-14 shows the U.S. EDI network services market. Growth will continue at about 19% CAGR. The momentum for EDI is strong, because corporate business process rationalization will continue to support the expansion of EDI.

Exhibit IV-14

EDI Network Services Market

	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	1995-2000 CAGR%
Traditional VAN Services	340	411	488	580	660	730	17%
Internet-related VAN services	0.2	5	12	40	90	200	298%
TOTAL VAN Service revenue	341	416	500	620	750	930	22%

Source: INPUT

INPUT forecasts that VAN revenue growth derived from Internet EDI will be very strong, at nearly 300% (although percentages are not too meaningful because of the low starting point). This forecast is based in large part on the strong commercial interest in Internet EDI and the potential that it has to increase spoke participation in EDI. It is predicated upon the confidence of the user population in the potential security mechanisms for the Internet increasing as familiarity grows.

Even though 300% is strong growth, it is not as high as the quantum leap in the EDI services market that has long been predicted by some pundits. INPUT believes that the Internet will have a much bigger impact on electronic commerce, but not necessarily through the EDI medium.

6. Summary of VAN Strategies

To summarize, INPUT believes that:

- VAN announcements in 1995 are a strong statement of the seriousness with which they believe Internet EDI should be taken.

- 1995 was a year of initial interest and testing of ideas.

- 1996 will be the year that formal offerings will be in place.

- Late 1996 and 1997 will see the Internet EDI market take off.

VANs believe, and the INPUT user survey supports, that:

- Pricing of VAN services is not an issue that is driving a large number of users to the Internet. Users understand the value of the services they receive.

- Users do not have a strong interest in the Internet unless the value-added services currently offered by the VANs are also available.

C
EDI Software Vendors

1.   Business Challenge

EDI translation software vendors will need to provide Internet-compatible functionality so that companies can use the Internet for the exchange of EDI transaction sets.   Support for SMTP and MIME/EDI protocols and public key cryptography are widely required features. To date, only Premenos has made such a product available. Premenos' Templar uses the SMTP/MIME protocols to transport an EDI message, and secures it using encryption and digital signature routines.

2.   VAN-Independent Software Vendor Strategies

Exhibit IV-15 lists non-VAN-related EDI translation software vendors who have announced an Internet strategy.

Exhibit IV-15

Internet/EDI Software Vendors

- APL Group
- DNS Worldwide
- Premenos
- St. Paul Software
- Supply Tech
- TSI International

Source: INPUT

Strategies include:

- Leveraging the current screen form orientation

- Enabling communications modules to communicate with the Internet

- Providing secure Internet services for EDI

a.   Leverage Forms Strategy

- A number of PC-based EDI translation software products have followed a screen forms-oriented technology that provides a custom screen development environment for viewing EDI data. This is the strategy that Supply Tech has used with great success in the marketplace. In this scenario, the user creates a data screen that presents, or accepts, data received from, or destined to, an EDI message. This approach was not designed to work within environments where integration to legacy application systems was required. With this software, users print the form and rekey the data into their legacy systems. Supply Tech is looking to market a new design of its proprietary screen entry system as an alternative data entry framework for use over the Internet. With the number of PC products that currently handle forms data entry (for example, JetForm), Supply Tech will find stiff competition becauese users may not see any incremental benefit to using proprietary software.

b.   Internet Communications Enabling

- The Internet strategy currently followed by St. Paul Software is to enable its software to communicate with the Internet. This is the same approach used to enable its software to communicate with any of the VANs.

- It is a very direct approach that does not have any security capability, and does not appear to support the SMTP/MIME protocols. Also, it would seem to indicate that St. Paul's users do not require access to the types of services VANs offer, and simply want the product to connect with the Internet. It would seem that St. Paul Software is following this approach while it evaluates the development of a more robust Internet strategy.

- For the moment, this approach does not impose any changes on users and the EDI strategies that the users follow, because it is simply adding a different communications script to the product.

c.   Secure EDI Module

Neither of the first two strategies addresses the security concerns that users have about doing EDI over the Internet. To send EDI transaction sets over the Internet reliably, the message file should be made secure. Premenos' recently released product, Templar, is representative of this new generation of EDI products for the Internet. Templar's design is based on existing standards, but since there is as yet no industry agreement on which of the multiple standards to use for this purpose, Templar cannot be said to be a "standard" approach. As such, it has come under some criticism (perhaps

unfairly) as being a proprietary approach, since a copy of Templar is needed at each end of the connection.

Templar uses public key cryptography, and the cryptographic keys used must be certified. This would normally be done by a trusted third party, also known as a Certification Authority (CA). However, these CAs are not in wide operation at this time. Thus it is not possible for a user to get independent certification of the keys being used by Templar. To get around this, the two Templar installs certify each other.

To broaden the use of secure EDI over the Internet, Templar is available for licensing by other EDI software companies. Late in 1995, DNS Worldwide, APL Group and TSI International announced that they had licensed the Templar technology for inclusion in their products.

3. Vendor WWW Strategies

The EDI translation software companies have stated that they feel they would experience significant market growth if they were to integrate their EDI translation software with web server applications. Their objective is to provide the enabling tools that will permit Web-based vendors to support electronic commerce more robustly over the WWW.

- EDI Web integration tools allow commercial Web-site software vendors quickly and easily to build connectivity between their servers and EDI transaction sets. TSI and St. Paul Software are preparing product offerings for Web server vendors.

- As one of the first companies to make an announcement, Premenos will be releasing, in early 1996, a product that will enable small to large organizations to create EDI transactions from their WWW sites.

4. VAN Translation Software Strategies

VANs that have developed Internet strategies complying with the "controlled connectivity" or "open connectivity" models have compatible software strategies as described in section B.3 above.

5.   Market Forecast

Exhibit IV-16 shows the U.S. EDI software market and forecast. Growth in the EDI software market will continue to be strong. As the VANs continue their penetration into the marketplace, EDI software vendors will benefit from users, need for EDI software. This is what is referred to as "traditional EDI software for VANs."

Exhibit IV-16

EDI Software Market and Forecast

	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	1995-2000 CAGR%
Traditional EDI S/W for VANs	134	155	178	200	214	222	11%
Internet S/W (VAN-Related)	0	2	6	18	40	80	N/A
Internet S/W (non-VAN)	0	3	6	12	22	40	N/A
TOTAL EDI S/W	134	160	190	230	280	342	21%

Source: INPUT

Based on strong corporate demand for VAN-related Internet EDI services, and expansion of WWW-based sales sites, sales related to the use of the Internet will grow very rapidly, as shown in Exhibit IV-16. To some degree, these are cannibalizing the traditional software sales.

The non-VAN Internet software sales are for standalone products such as Templar from Premenos. Consistent with INPUT's finding that most users will use Internet EDI in a way that co-exists with their VAN usage (rather than replacing VANs), INPUT is forecasting that this standalone approach will result in about 9.5% of the total software market by 2000.

There are additional revenues available to the EDI software companies for the sale of EDI software to the World Wide Web (WWW) server vendors to automate the back-end connection from the server to the fulfillment processors. This is a very significant new opportunity that is discussed in detail in Chapter V of this report, and forecasted in Exhibit V-3.

6.   Summary of EDI Software Vendor Strategies

The vendors and their strategies are summarized in Exhibit IV-17. To date, only three of these companies (TSI, St. Paul Software and Premenos) have demonstrated the potential for Web server integration.

Considerable growth is expected from the WWW marketplace, and EDI translator software vendors have the opportunity to consider how they can assist and participate in this growth.

Exhibit IV-17

EDI Software Developer Strategies

Strategy	Strength	Weakness	Vendor Example
Leverage Forms Strategy	simplifies user interface	proprietary	Supply Tech
Internet Communications Enabling	enables quick and easy communications with the Internet	does not address security issues	St. Paul Software
Secure Module	addresses security issue of the Internet can be licensed to other EDI S/W products based on open systems standards	requires products at both ends of the connection	Premenos TSI International DNS Worldwide APL Group
Controlled Connectivity	highly secure ensures delivery and integrity	imposes differing communications approaches to the Internet	Sterling
Open Connectivity	Internet-capable user software		Harbinger Net Services

Source: INPUT

D

Value of Goods and Services Traded Using Internet EDI

Exhibit IV-18 shows the market and forecast for the worldwide value of goods and services traded using EDI.

Exhibit IV-18

Value of Goods and Services Traded Using EDI

	1995 ($B)	1996 ($B)	1997 ($B)	1998 ($B)	1999 ($B)	2000 ($B)	1995-2000 CAGR%
Traditional VAN EDI	130	151	179	208	240	277	16%
Internet-related VAN EDI	0	0.2	2	10	30	70	N/A
Internet (non-VAN) EDI	0	1	3	7	20	36	N/A
TOTAL G&S SOLD	130	152	184	225	290	383	24%

Source: INPUT

The first line shows the future for the traditional VAN activity (i.e., not using the Internet). This growth rate is slower than that currently being experienced because of partial cannibalization of the Internet activity.

The Internet-related VAN EDI line shows the value of goods and services sold through the Internet offerings of the VANs. The Internet non-VAN EDI line shows goods and services sold without VAN intervention, for example via products such as Templar. The non-VAN-related sales are significantly lower than the VAN-related sales, consistent with INPUT's finding that most users will have an Internet/EDI strategy that co-exists with their VAN usage.

E

Current EDI Activities on the Internet

1. Findings

INPUT found significant existing activity in the implementation of EDI over the Internet. The projects shown in Exhibit IV-19 range in status from production systems to beta test situations. From the interviews INPUT conducted, it would appear that there is gathering momentum to use the Internet for the transmission of EDI documents.

Exhibit IV-19

EDI Activities over the Internet

Sector	EDI Transactions	Status	Participants
Education	Transcripts and related documentation	Production	Universities and colleges, such as the University of Texas
Research Libraries	Subscription and Purchase Publications Orders and Payments	Partial Production	Universities, Colleges and Corporations, such as U.C. Berkeley
Government	Requests for Quote	Production	Government agencies, LLNL, and VANs
	Purchase Orders	Production	Government agencies, LLNL, and VANs
	Contract Awards	Production	Government agencies, LLNL, and VANs
	Invoicing	Testing	Government agencies, LLNL, and VANs, FedEx
	Payments	Testing	Government agencies, LLNL, VANs, Bank of America, Banc One
Commercial	Purchase Orders	Production	AVEX, National Semiconductor, NASA
Retail Industry	Sales Statistics and Forecasts	Testing	Textile industry and Idaho National Engineering Laboratory
Contract Servicing Industry	Product Service, Claims and Work Orders	Testing	Hardware contract service companies

Source:INPUT

The respondents acknowledged that security and confidence of delivery are prime concerns (where security mechanisms are not in place). However, they unanimously feel that the security solutions currently available are adequate for their purposes and that proper systems design overcomes the issue surrounding uncertainty of delivery on the Internet.

As the interviews indicated, the participants took different approaches to security. For example, the payments pilot at LLNL with Banc One and Bank of America uses public key encryption, with digital signature, while the textile industry project, where no security is used, relies on the software to

ensure complete delivery of the data through timing and confirmation verification steps.

Exhibit IV-20 lists the issues that are most often cited as reasons not to use the Internet for EDI, and how the participants addressed them.

Exhibit IV-20

Issues of EDI over the Internet

Issue	Resolution
Security of the Data	Templar, PEM, S/MIME
Authentication of Sender	SMTP authentication of "From" Public Key / Digital Signature Templar
Assurance of Delivery	Software redundancy, Timing cycle for receipt of confirmation message Templar

Source: INPUT

INPUT found that the primary problem these participants face is that there is a user perception that the Internet is neither reliable nor secure. The project experiences to date indicate that it is possible to transact EDI over the Internet, and to do so successfully, notwithstanding these issues.

Another proposed approach to exchanging EDI transaction sets is to use FTP, or file transfer protocol. Although this protocol can address the security and timeliness issues, it imposes additional application software requirements and a higher level of resource management at both ends of the communication. The company that is maintaining the EDI FTP site would also be responsible for maintaining the trading partners, and issuing and refreshing passwords and ID codes.

Exhibit IV-21 details the security strategy for Internet EDI initiatives from Exhibit IV-19.

Exhibit IV-21

Security Strategies for Internet EDI Implementations

Sector	EDI Transactions	Security Level Implementation
Education	Transcripts and related documentation	Clear Text
Research Libraries	Subscription and Publications Purchase Orders and Payments	Secure
Government	Requests for Quote	Clear Text
	Purchase Orders	Clear Text
	Contract Awards	Clear Text
	Invoicing	Secure
	Payments	Secure
Commercial	Purchase Orders	Clear Text and Secure
Textile Industry	Sales Statistics and Forecasts	In the future
Contract Servicing Industry	Product Service, Claims and Work Orders	Testing

Source:INPUT

In all cases, the surveyed participants ranked their reasons for using the Internet. These included:

- Cost reduction—The volumes of data that are involved in each of these initiatives is considerable. The cost to establish these initiatives over a VAN would have been prohibitive. In one project, the estimated savings over a three-year period are projected to be $1.5 million.

- Speed and timeliness of communications—In many applications there is a need to send data in near real-time. To achieve these goals would be prohibitively expensive if a VAN were used, due to the cost of operating a dedicated line. INPUT's survey found that the majority of the participants had already installed high-bandwidth connections to the Internet, such as T-1 and T-3 lines. Thus, it was a simple matter of implementing the appropriate EDI software.

- Reliability—Reliability is an important issue for time-sensitive documents such as payment instructions. While acknowledging the fact that the distributed nature of Internet resources can be problematic, the respondents have not, through the practical experience of these projects, found there to be any significant problems with reliability of delivery.

Participants fully intend to expand the number of trading partners that connect via the Internet. As experience with the Internet grows, they will initiate the migration of trading partners from VANs to the Internet over the next four to five years. The primary reasons for this are cost effectiveness of Internet technology and the Internet's ease of use.

Issues of security and delivery are paramount in many users' minds. However, INPUT's survey found that, in the commercial application of EDI over the Internet, users that report sending EDI data in the clear have found no problem with this approach. Further, authentication of the sender was accomplished by examining the "From:" field in the message envelope.

Even though INPUT believes that this is not the most secure means of authentication, as it is easy for an attack to be made on the mail envelope, there are situations in which security is not a concern and users are experiencing no problems. INPUT believes that this approach is too risky for sending payment instruction messages, however.

2. Case Studies

a. Lawrence Livermore National Laboratory and Bank of America

This EDI pilot involves payment instruction from LLNL to the BoA based on approved FedEx invoices processed by LLNL. The mechanism involves the encrypting of an E-mail message that contains the EDI payment instruction (X12-820). The pilot involves about 10 freight carriers, like FedEx, from whom LLNL receives over 30 invoices per week.

The principal reason for this effort is cost reduction. Also, BoA, Banc One, and LLNL expect that this effort will prove that Internet-based EDI is secure, reliable and convenient. By using public key encryption and digital signatures, non-repudiation of the transaction is achieved. LLNL estimates that this will cut communications cost by over 25% and achieve better, on-time performance.

A high level of security is achieved by placing limits on the length of time passwords remain usable. By implementing this approach along with an electronic confirmation process, the participants believe that the exposure to a hacker's attempts is greatly reduced.

b. Banc One-RoweCom

Banc One and RoweCom have collaborated to provide university and corporate research libraries with an integrated ordering and payment system that operates on the Windows platform. RoweCom, as a broker for a wide variety of book and magazine publishers, has developed a GUI frontend that lets the librarians choose the books and publications required. Upon completion, a payment instruction message (820) is constructed listing the items purchased and including the numeric identifier of the purchasing library. Security is achieved through SSL between the front-end software and the Open Market server. The message is also digitally signed using a 132-bit key.

The message is sent via the Internet to Open Market's Merchant Solution, where the order is validated as being from a certified purchaser. The order data, the same 820, is passed onto RoweCom and Banc One for execution. At Banc One, the numeric identifier is used to build the payment clearance information.

At present, 10 to 15 libraries and two or three publishers are involved, with a full roll-out to start in February 1996. To date, transaction volumes have increased to one million orders. RoweCom expects to clear up to eight million orders in 1996. The next phases will involve the claims process for lost issues or replacement books and the fulfillment process.

Banc One and RoweCom chose the Internet because their client base was already Internet capable and cost conscious.

c. Victor-Dana

Victor-Dana is an automotive industry supplier. It is using the Internet to communicate with its suppliers. The decision to use the Internet was based on the need for immediate connectivity between manufacturing systems. Victor-Dana is receiving Advanced Ship Notices (856) and sending out Planning Schedule and Release (832) messages. So far, this is being done with two trading partners, with a volume of 500 messages per month.

As security in these messages is a minimal requirement, the EDI messages are left in the clear, within the SMTP envelope. MIME attachments are not being used. When delivery of the message is not assured, a print image file is created and faxed to the supplier. For large, binary CAD files, Victor-Dana and its suppliers are using FTP. The current plan is to expand the number of trading partners and to implement other EDI transaction sets, such as the Test Results message (863).

Victor-Dana is using the Internet due to the lower cost of transferring large binary files, and to the timeliness of delivery.

3.   Summary

INPUT concludes that the lowcost and flexibility of the Internet has opened new avenues of technology to meet business needs. Commercial and government organizations that have examined the enabling technologies of the Internet have concluded that it is a viable business communications medium. However, the applications involved are not necessarily typical, so these conclusions are not to be too generally applied.

F
Anticipated Evolution

Exhibit IV-22 lists INPUT's view of the anticipated evolution of this market sector.

Exhibit IV-22

Anticipated Evolution

- ISPs upgrade value-added services
- EDI translator - WWW server integration
- Closer supplier-customer ties enabled

Source: INPUT

Internet service providers (ISPs) do not have the service and support infrastructure that the VANs have. Nor does SMTP have all of the message acknowledgment capabilities that closed electronic mail systems, such as AT&T Easylink or cc:Mail, have.

These service and support issues are being addressed as ISPs such as UUNET, Netcom and PSI gain size and funding to be better positioned to provide truly national customer service.Also a draft update to the SMTP standard has been published that addresses the acknowledgment capability.

The future is clearer for the EDI translation software companies. With the significant increase in the number of companies doing EDI over the Internet, there will be a similar increase in demand for translation software. However, this demand will only be addressable by those vendors who make their software Internet capable.

INPUT concludes that EDI software will be seen more rarely as a stand-alone process, and more frequently as a built-in process as client server technology spreads.

EDI on the Internet will increase as companies come to better understand the business model that underpins it. Standards for security, assurance of

delivery and the time-sensitive nature of the Internet will be the prime factors that will encourage commercial and other organizations seriously to evaluate the role of the Internet as a carrier of EDI transaction data.

Over the past few years, just-in-time manufacturing and inventory management has become widely implemented. This has engendered closer business relationships. The next step is for businesses to use the Internet to make each other's manufacturing, or sales and inventory systems visible to each other's application systems. This could be accomplished by extending the capabilities of the current automated systems to include the ability to format and send out an EDI message, secured according to Internet standards.

INPUT's survey reveals a high degree of interest in using the Internet to close the cycle of resource acquisition and payment. The resolution of user perceptions concerning Internet reliability and security, and the establishment of standards that developers can write to, will further encourage the growth of electronic commerce over the Internet.

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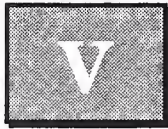
Commerce Over the World Wide Web

This chapter examines electronic commerce activity over the World Wide Web. It discusses how electronic commerce is supported by WWW software vendors, the experiences of vendors on the WWW, and the payment mechanism alternatives that are available to buyers of goods and services.

- INPUT interviewed eight Web server vendors, such as Open Market, SpyGlass and Frontier Technologies, and 14 organizations that market through Web servers, such as CDNow, the Internet Shopping Network and Branch Mall.

A
Business Environment

To date, the WWW has seen consumer-oriented commerce predominate. Over the next five years, INPUT forecasts that business-to-business commerce will become dominant over the WWW. This is discussed in detail in a companion report by INPUT, *Electronic Catalogs, Web Storefronts and Internet Malls*. The commercial activities on the Internet parallel those of the television shopping networks, the 800 telephone number sales medium, and the electronic malls of on-line services, such as CompuServe.

Today, over 30 million users have access to the Internet. This represents significant potential for electronic commerce applications. With close to 100,000 domains available worldwide, the quantity of information, goods and services is vast, opening up commercial opportunities for the sale and distribution of this information.

As an example of the opportunities for sales growth and the heightening of organizations' profiles, on-line book stores have found great success on the Internet. Additionally, smaller businesses such as Virtual Vineyards have

been able to contact their customers more easily and to provide their customers with better service.

INPUT's survey found four issues that Web server vendors and Web-based vendors face in their efforts to promote electronic commerce on the WWW:

- The user perception that the Internet, and by extension the WWW, lacks adequate security

- Enhancement of server and browser software performance in areas such as graphic file downloads

- Extended features for Web sites and back offices, such as integration with in-house application systems

- Technologies and strategies that vendors on the Web can use to distinguish themselves from other sites so that they can maintain a competitive edge and retain their customers

B
Web Server Vendors

Companies that have a presence on the WWW are becoming more sophisticated. It is no longer sufficient to be on the WWW, but now it is increasingly important to be seen to be accomplishing something with that presence.

In response to these changing expectations, Web server vendors are implementing new capabilities and features. Exhibit V-1 shows the major Web server vendors, and Exhibit V-2 shows the new features being implemented. Those in Exhibit V-2 - Group II will support and enhance the ability to conduct electronic commerce over the WWW.

Exhibit V-1

Web Server Vendors

- Open Market
- Spyglass
- O'Reilly and Associates
- Netscape
- Frontier Technologies
- The Internet Factory
- IBM
- Process Software

Source: INPUT

1. Vendor Strategies

The Web server industry is young, having only started in 1991 when the HTTP and HTML protocols were released at CERN in Switzerland. By mid-1993, the first version of the Mosaic browser was released. In the ensuing two-and-a-half years, the browser market has seen many changes and additions to the feature set, along with enhancements to the performance of the server and browser software.

In their initial release, the browsers made it easier to access information pages put up on the Internet by researchers and academicians using HTTP/HTML protocol and formatting standards. Now they are supported by add-on software, supporting digital cash, scripting languages and animation, for example.

Exhibit V-2 lists some of the features that the Web server vendors have implemented to date (Group 1), and those that are now being developed (Group 2).

Exhibit V-2

Evolution of Web Server Features

Group I - Recently Released
- Access HTML pages
- Allow for bookmarks
- Allow for list creation

Group II - For Future Release
- Full development suite
- Integration API beyond CGI
- EDI integration
- Security and Commerce Protocol support

Source: INPUT

Typically, technology developments move through three discrete phases:

- Proof of concept

- Feature enhancement and extension

- Market maturity

It is useful to track the development of server and browser technology through these phases. The industry has not yet arrived at the characteristic step of consolidation that marks the market maturity phase.

2. Technology Development Phases

a. Phase I—Proof of Concept

In Phase I, the developers of the WWW browsers concentrated on improving upon the initial Mosaic design, such as adding in features for bookmarking (the process of saving in a local file a Web page's unique address or URL), custom hot list creation and faster graphic file downloads. Though these efforts did not address security or performance enhancements, they were very successful in proving the WWW concept to users.

b. Phase II—Feature Enhancement and Extension

When Netscape Navigator was released in the fall of 1994, it included a technology called Secure Sockets Layer (SSL). SSL, for the first time, allowed Web site managers (Webmasters) to secure commercial transactions

over the Web. Up to that point, security over the WWW had not been addressed.

Additionally, the market has seen the release of progressively smarter and faster servers and browsers. This has enabled sales-oriented Web sites to become more creative in their content. For example, Open Market's Merchant Solution extended the breadth of a server's technical capabilities for commercial transactions by integrating a number of previously separate services.

During 1995 there were a number of protocol proposals for securing commercial transactions in response to strong user demand for secure, commerce-grade products. A companion report from INPUT, *Electronic Catalogs, Web Storefronts and Internet Malls,* studies these developments closely.

INPUT also found great interest in the application of Web server technology for purposes such as information distribution, timely updates of financial or procedural data, and the execution of electronic auctions. To support these developments, Web server and browser vendors are addressing the features enhancement phase in these five areas:

i. *Full Development Suite*

Businesses want to establish themselves on the WWW quickly and easily. In order to do so, they need a tightly coordinated toolset with which to work. This toolkit would contain a CGI scripting tool, HTML authoring tool, database integration tool and an imagemap development tool. These four tools, combined in a seamless manner, can greatly simplify the effort of building a Web site.

Today, these tools are standalone add-ons that consume resources, require configuration and often are highly technical in nature. Products such as Softquad's HoTMetaL Pro, and Corel's Draw program are examples of these products.

There is also an add-on market for integration tools. Companies such as Spider Technologies and Vermeer Technologies have released products that support advanced publishing capabilities.

An alternative to this full suite offering is to provide vendors on the Web with access to a central service bureau. The central service bureau is a suite of back-office processes that includes applications software to handle security, EDI, credit card clearances, inventory and catalog maintenance. This approach is being offered by Open Market, and by two of the EDI VANs, as part of their managed Internet services offerings (AT&T, IBM Global Network). This "for fee" approach will be attractive to vendors who prefer to

outsource the back-office operations of their Websites, allowing them to concentrate on attractive and successful content. The service fee range is from $0.50 to $1.00 per transaction.

ii.   CGI Replacement

Web software vendors are also developing generic integration APIs. These will co-exist with, or replace, Common Gateway Interface (CGI) scripts. The CGI connects an HTML form and its contents with a background process that executes a user request. Spyglass, Microsoft and Netscape have been active in developing alternatives to CGI that are easier to use and more flexible. Microsoft is developing, as part of its Blackbird project, an API called Internet Services API (ISAPI), and Netscape has released Netscape API (NSAPI).

In INPUT's view, the development of open, documented, industrial-strength APIs will further the growth in the commercial use of the WWW by helping to simplify the commercialization process.

iii.   EDI Integration

In the execution of a commercial transaction on the WWW, the communication between the user and the browser does not require EDI software or protocols. However, the back-end fulfillment process for that transaction will require EDI, or similar functionality. For example, a shop that is selling hard goods such as radios and stereos does not actually have the inventory on hand. It provides its supplier with the delivery and sales details. If this is based on paper, then the vendor is eating into its profits. If the authorized sale were instead formatted to the EDI standard protocols, then the exchange of information with the supplier would be more reliable, more timely and at a lower cost.

Web server vendors, such as Open Market and SpyGlass, are in current discussions with EDI software developers, such as Premenos and St. Paul Software, as to how this functionality can be built into Web server software.

iv.   Security and Commercial Protocols

To enable security on the WWW, the Web server vendors are addressing the issue from two perspectives: transport security and data security. For both of these, there are competing protocol proposals.

- For transport security, there is Secure Sockets Layer (SSL) from Netscape and Private Communications Technology (PCT) from Microsoft

- For data security, Netscape and MasterCard propose the Secure Electronic Payment Protocol (SEPP), and Microsoft/Visa propose Secure Transaction Technology (STT) (In January 1996, Visa and MasterCard announce that they will develop a joint standard, but no draft has been made public.)

INPUT's survey has found that the Web server vendors are pragmatic when faced with multiple protocols. While neither of the proposals is yet a standard for either of the security layers, the protocol proposals have been published. In the interests of responding to the demands for secure servers, the Web server vendors intend to support both of the proposed protocols within each layer.

v.   Performance Enhancement

The primary approach implemented by Web software vendors to address performance issues has been to introduce caching techniques to the client (browser) software. The caching technique works on the basis of saving the most recent set of Web pages that the user accessed. The next time the user visits the same site, the Web page is loaded more quickly because the browser is accessing the "cached" local file. However, the downside of this approach is that if the Web site changes frequently, the user will still have to poll or reload from that Web site in order to stay current.

Another area of performance enhancement being investigated deals with the technology underlying the search engines that Web servers use. When a user is looking for local information, a well-designed search engine will perform quickly and accurately. Verity's search engine is currently the market leader. It is being licensed into the server products from such companies as Netscape and Oracle.

c.   Phase III—Market Maturity

The commercial WWW marketplace for product and services has not yet reached the market maturity phase. It is expected to reach maturity within the five-year forecast period.

3.   Market Forecast

Prices for commercial Web servers are falling. Recent price cuts by companies like Netscape serve notice that there is increasing competition. More firms are entering the Web server marketplace, including Oracle, which are marketing OEM server products.

INPUT found, during its interviews with Web server vendors, that they believe that the implementation of secure protocols will generate significant

market growth. This is in spite of the fact that there are multiple alternative protocols.

The U.S. market forecast, as shown in Exhibit V-3, shows six times the revenues for 1996, and two and a half times for 1997. Thereafter, the growth rates will retreat to more sustainable levels.

Exhibit V-3

Web Server and Web EDI Market and Forecast

	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	1995-2000 CAGR%
Web server software	110	670	1660	2080	3300	3600	101%
EDI S/W Sales to Web vendors	0	1	10	45	95	180	N/A

Source: INPUT

There has been no breakout of security software to support Web servers or secure versions of servers because the Web server vendors, such as SpyGlass, Frontier Technologies, and Open Market (though not yet Netscape), now regard the inclusion of secure services as a standard feature of their server products.

Exhibit V-3 also shows the potential sales of EDI software to the Web server vendors. In order to conduct commerce over the Web, the Web servers must be connected to the legacy systems that will ensure fulfillment of the orders taken by the servers. Although EDI is a technology capable of filling this role, and EDI software vendors are actively pursuing the opportunity now with Web server vendors, there still remains the possibility that the Web server industry will take its own separate path for fulfillment, not involving EDI.

4. Value of Goods and Services Traded Over the WWW

The worldwide value of goods and services traded over the WWW is examined in detail in a companion report, *Electronic Catalogs, Web Storefronts and Internet Malls.*

The current situation and forecast for 1995-2000 is shown in Exhibit V-4.

Exhibit V-4

Value of Goods and Services Traded Over the WWW

	1995 ($M)	1996 ($M)	1997 ($M)	1998 ($M)	1999 ($M)	2000 ($M)	1995-2000 CAGR%
Business-to-Business Sales	30	250	1400	6300	32000	120000	425%
Business-to-Consumer Sales	40	190	850	3500	14000	45000	308%
TOTAL G&S SOLD over WWW	70	440	2250	9800	46000	165000	373%

Source: INPUT

C

Vendors on the WWW

1. Business Environment

There have been vendors using the Web since early 1994. As an example of their experience, the operators of the Branch Mall indicate that their tenants have a 65-70% occupancy renewal rate year over year. They believe that there is profitable business to be transacted over the WWW.

INPUT has found that the successful players are those that have bred consumer loyalty. As an example, ISN and CDNow have based their success on working hard to deliver useful value-added services to their customers. CDNow is able to offer its clients comprehensive catalog lookups for hard-to-find music or video releases. This kind of service encourages the development of closer relationships between the user and the vendor.

As a further move in this direction, ISN, for example, is planning to use the suite of protocols and features soon to be released that will offer Web site developers a high degree of "server personalization." As a browser enters the server's space, the server can respond by delivering a personalized "page" to the user. By working from a database of past purchases, the server will be able to display discount coupons and special offers on items related to those prior purchases.

INPUT found, based on discussions with vendors such as ISN, CDNow and AT&T, and research for the report *Electronic Catalogs, Web Storefronts and Internet Malls* that typical spending ranges were from $37 to $300 per

purchase. ISN reports about 275,000 visits per month with a purchase rate of 3%. This comes to monthly revenues of $725,000. Note that the 3% "buy rate" is consistent with the experiences of the direct mail sales industry.

In November 1995, <u>AT&T Easy World Wide Web Services</u> announced a strategy to provide managed Internet services for organizations interested in establishing an Internet presence. In a survey of its 1-800 number customer base, AT&T found that over 60% are very interested in offering Internet services. Published statistics show that the average 1-800 number purchase is about $75. Based on a conservative 45% take-rate among the 1,000,000 1-800 number service subscribers, this translates into a projected sales volume of over $33,000,000. The roll-out through 1996 will have an important impact on the marketplace's credibility with purchasers. Bearing in mind that AT&T has a credit card division to assist in payment clearances, it will also lend credibility to the security of the Internet.

Exhibit V-5 lists a representative sample of the types of companies that maintain an Internet presence and have enjoyed sales success. Some of these do not support on-line payment settlement. The principal reason appears to be lack of back-office mechanisms to support credit card clearance.

Exhibit V-5

Representative Vendors on the WWW

Vendor	Market	Secure Transactions?
Virtual Vineyards	Wine and Supplies	Yes
HNR Computers	Hardware and Software	
Duthie Books	Books	
Home Automation Systems	Automatic Control Systems	
The Internet Mall	Store Mall	Yes
Movie Fone	Cinema Tickets	Yes
Shop-On-Line	Catalog	
OzNet	Store Mall	Yes
Internet Shopping Network	Catalog	Yes
CDWorld	Music World	Yes
NECX	Catalog	
Branch Mall	Store Mall	Yes
CDNow	Music Store	Yes
PAWWS	Securities	

Source: INPUT

2. Vendor Sites

a. CDNow

CDNow, based in Pennsylvania, enjoyed very good success in 1995 by following a simple formula: give the consumer options, whether they be related to product selection or payment. This has built the customer loyalty that CDNow has found to be an important factor in its success to date. While price is certainly one reason for a consumer to buy electronically, a well-organized WWW-based vendor like CDNow can provide a value-added service that a 'real-world' vendor can not. It offers quick and responsive access to a manufacturer's database of all the products in its catalog. This value-added process has helped CDNow achieve a successful retention rate of its visitors for further business and service development.

Regarding payments, CDNow has had few inquiries from its customers about the security of their credit card information. In fact, a significant number of them send their credit card information "in the clear" (i.e., unencrypted).

b. Internet Shopping Network

As an Internet version of the Home Shopping Network, ISN has found success with the same formula that HSN uses: provide the purchaser with a wide range of choices at competitive prices. ISN has found that it is very important to keep user interest high and to keep the revisit rate as high as possible.

To address these two issues, ISN is looking forward to the next generation of Web server tools and document standards that will allow it to provide additional values, such as discount coupons. ISN has identified speedier credit card authorizations and closer electronic links with its suppliers as important back-office processing issues that will be addressed in 1996.

3. WWW Hosting Services

Companies can outsource the management of their sites to a WWW Hosting Service offered by the likes of AT&T, IBM, Sterling Software and Harbinger. These provide companies with a secure means of establishing a WWW presence as an add-on to their VAN services.

Web hosting services leverage the technical and support organizations that the VANs have established. By having this service provided by the VAN, the user company retains access to the support and technical infrastructure of the VAN. As documented in Chapter IV of this report, users have indicated that this is important to them.

Exhibit V-6 lists the VANs that are active in this area, and the services they have announced to support companies and organizations that want an Internet presence.

Exhibit V-6

Representative WWW Hosting Services

Value-Added Network	Service	Characteristics
IBM Global Network	Web Sites Authoring and Support	Worldwide network
Sterling COMMERCE:Network	Web Sites Authoring and Support, and Back-Office Integration	Integration with current EC network services
AT&T Easy World Services	Web Sites Authoring and Support, and Payment Clearance	Worldwide network and dispute resolution services
Harbinger Net Services	Web Sites Authoring and Support	Low cost and experience in working with small and medium-sized businesses

Source: INPUT

Exhibit V-7 shows how the WWW Hosting service relates to a VAN's EDI offering, which is provided through the VAN's data center. VANs also envisage offering their clients the capability to link these Web sites to their back-office operations, as well as to the payment clearance system.

Exhibit V-7

VAN-based WWW Hosting Services
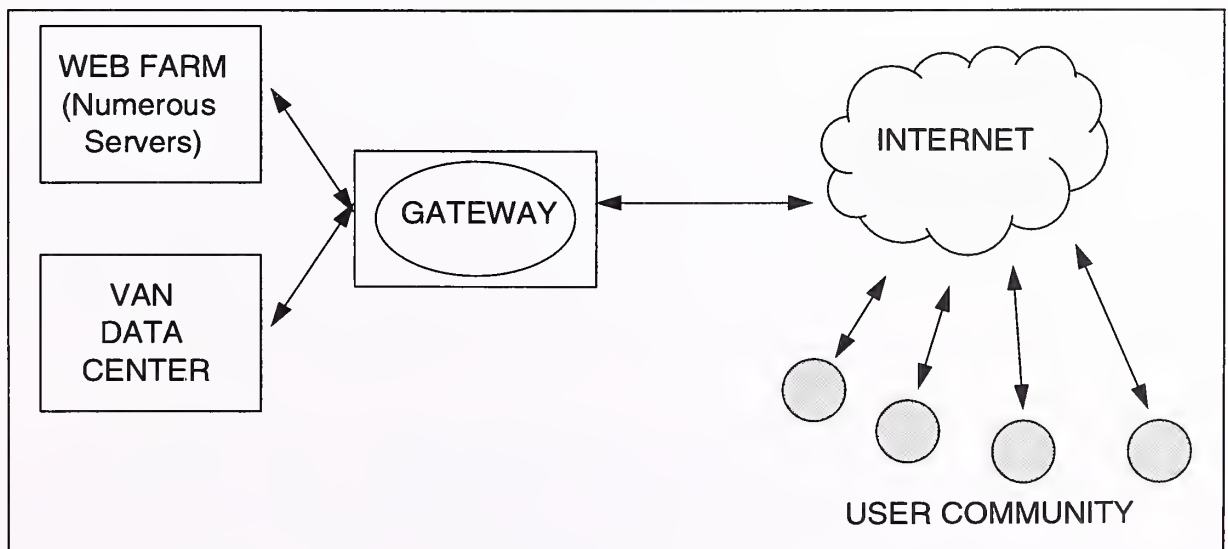
Source: INPUT

4. Back-Office Integration

As noted earlier, INPUT's survey identified the Web-based vendors' concerns about the back-office processes that support their activities on the Internet. In general, the vendors' fulfillment processes with their suppliers are paper or telephone based. Their objective for 1996 is to automate these back-end processes, as well as the credit card verification process, fully. To do so, they need to be able to connect their HTML forms easily to the databases and applications that support their internal operations.

For example, when a user places an order on a vendor's Web page, the data is captured by the HTML form and passed to a CGI script for processing. At the moment, this means the order data is often printed onto paper and manually rekeyed into the vendor's order entry system. This increases a vendor's cost of operations. If, instead, the order were processed directly from the Web page to the order entry system, it would reduce operating costs and keying errors, and speed up the response time to the user. Exhibit V-8 lists companies that are working on connectivity protocols that will work with the vendors' WWW pages and the HTML forms content.

Exhibit V-8

Database Vendors Developing WWW Services

Vendor	Product
IBM	DB/2
Computer Associates	CA-OpenIngres/ICE
Informix	Informix
Oracle	Oracle
Sybase	System 11
Microsoft	SQL Server

Source: INPUT

The connectivity of these database products is important because it is database products such as these that underlie the in-house applications that the vendors use for their operations, such as order entry. By facilitating this connectivity, the database software vendors will help address the three goals mentioned above: cost reduction, error reduction and enhanced time responsiveness.

Similarly, EDI software vendors can address these three goals by establishing connectivity between their products and the Web servers. In many cases, the user's order will not go to an order entry system, but rather directly to the manufacturer of the good that was ordered. Thus, it can be seen that EDI/HTML form connectivity provides the Web-based vendor with a cost-effective means of handling commercial transactions.

D

Primary Payment Mechanisms

Vendors on the Internet face a key problem: how to secure, and cost-effectively clear, credit card payment instructions. While no serious attack has been documented on credit card numbers used over the WWW, users have the perception that there is a security problem with the Internet. The potential for problems is certainly real if credit card numbers are sent without encryption, but even encryption is not yet trusted by the public at large, despite the fact that experts believe that the DES and RSA data security schemes are effective and reliable.

None of the vendors surveyed reported having experienced any problems with the transmission of credit cards and the settlement of any of their transactions. In fact, INPUT's interviews with vendors such as ISN, CDNow, and Branch Mall revealed that a substantial percentage of on-line purchases are settled using credit cards transmitted in unencrypted form, as shown in Exhibit V-9.

Exhibit V-9

Use of Payment Mechanisms

Payment Mechanism	Percentage Use
Encrypted On-Line Credit Card Submission	30%
Unencrypted On-Line Credit Card Submission	20%
1-800 Number Confirmation of Credit Card Number	20%
Other Traditional Means (Mail, Fax)	30%
New Payment Mechanisms	Too low to measure

Source: INPUT

MasterCard has stated that the $50 fraud limit does not apply on the Internet. WWW-based vendors, on the other hand, have maintained that, since the cardholder agreement does not explicitly exclude use on the Internet, the $50 limit does apply. The credit card holder's legal liability would seem to be in doubt should the person use the credit card number over the Internet. Some vendors, such as the Internet Shopping Network, have stated that they will protect the consumer from such fraud, in the interest of building consumer loyalty.

As Exhibit V-9 shows, about fifty percent (50%) of all sales on the WWW are settled with a credit card. Twenty percent (20%) of the total payments involve credit card numbers being sent unencrypted. When asked about this behavior, since it appears contrary to the reported consumer perception of the Internet as insecure, the vendors stated that consumers who use the Internet are sophisticated and aware of the technology's capabilities. Thus, they

generally have fewer qualms about sending credit card information over the Internet. (INPUT also believes that many of those consumers who have the negative perception are not yet purchasing as a result.)

"New payment mechanisms" includes the services of DigiCash, CyberCash and similar organizations. The share they enjoy is listed as "too low to measure" because few of the Internet vendors yet support these alternatives. Use of First Virtual's technology revolves around the mall that it itself set up. "Other traditional means" includes faxes, purchase orders, and mailed checks.

Credit card use on the Internet will continue to grow as various security protocol standards are resolved. MasterCard's stated intention is to have a functioning, secure Internet strategy implemented by April 1996. Given the low volume of sales over the WWW, the position on fraudulent credit use that the vendors have taken would appear to be reasonable. However, INPUT believes that as commercial volume grows, WWW-based vendors may take a second look at that policy. By then, secure protocols should be in place anyway.

E

New Payment Mechanisms

As an alternative to the payment approaches noted in the previous section, Exhibit V-10 lists four new approaches. The basic assumptions behind these are that:

- The Internet is insecure.

- Users do not wish to transmit their payment information.

- Sellers require a trusted third party to limit risk.

- Digital signature is an unproved technology.

These new payment technologies have not yet gained good acceptance in the marketplace. There seem to be two reasons:

- The offering organizations do not yet have credibility

  - The fact that these organizations do not represent, nor are parties to, the bank clearing and credit card authorization systems gives rise to questions of credibility. In fact, they generally operate as intermediaries between the consumer/merchant and the credit card/bank.

- Security mechanisms are not yet proven technically

  - While they propose to use digital signatures and public key encryption, the question still remains as to whether they are implementing the technology correctly.

    As noted earlier in this report, the Internet community and its success are based upon open and replicable standards. Thus, the difficulty many organizations have with third parties is that the third parties have not published their protocols for public review. Therefore their technology is not yet trusted.

Where purchases involve micropayments, these new mechanisms would appear to have an advantage. In this scenario, the purchase is often intellectual property, where the price is in cents and the cost of the transaction must be kept to a minimum.

With over 100,000 information databases available today, the Internet brings the cost of delivery down dramatically. To expand their markets, on-line information databases want a technology that best protects their intellectual rights, while at the same time encouraging the impulse purchase by users.

An upcoming INPUT report studies these payment technologies and their prospect for future acceptance in detail.

Exhibit V-10

Third-Party Payment Mechanisms

New Payment Mechanism	Description
DigiCash	Consumers exchange cash for tokens and use these, via specialized software, to make purchases.
CyberCash	Using specialized software, the credit card number is encrypted and cleared by CyberCash through the credit card clearance system.
First Virtual	Credit card information is held in a database by FV and purchases are applied against it.
NetBill	Consumers use a 'wallet' that is stored on their PC to settle purchases that are cleared by a specialized NetBill server.

Source: INPUT

1. Electronic Cash Systems

a. DigiCash

DigiCash operates on the basis of a bank issuing tokens to a subscribing user. These tokens represent actual cash withdrawn from that user's bank account.

These tokens can then be used for purchases from participating vendors on the Internet. In October of 1995, Mark Twain Bank of St. Louis became the first bank to offer such a service.

The user uses these tokens via a software client that works within the user's browser software. Whenever a transaction is to take place, there is an icon on the screen that signifies to the user that tokens may be used for payment. As with other digital cash alternatives, there is the requirement on the part of the user to incur additional costs such as sign on fees and transaction fees associated with authenticating and clearing the tokens when used, and to install additional software.

b. CyberCash

CyberCash works on the principle that the user does not want the merchant to see the credit card information submitted for payment. Therefore, both the user and the merchant use specialized software to generate a payment order that includes the purchase details. This order is forwarded to CyberCash's server for validation. Once validated, the order is forwarded to the credit card clearance system. Once cleared, the confirming data is transmitted back to the merchant.

c. First Virtual

For the user concerned about credit card information transmitted over the Internet, First Virtual has developed an alternative approach. Through a traditional registration process, the user provides FV with relevant personal and credit card information.

As purchases are made, they are charged against the registered credit card. This charge is consummated only upon receipt of an E-mail confirmation to FV that the downloaded intellectual property is to be kept and used.

d. NetBill

NetBill operates as a server that maintains a customer's account information and a merchant's account information. Whenever a transaction is executed, the funds are transferred from one NetBill account to another. The customer's account is replenished from either his own bank account or from a credit card. In turn, the merchant gains access to the accumulated funds when they are deposited in its bank account.

The intellectual property is delivered to the consumer in an encrypted form that is verified to confirm error-free receipt of the information. Once confirmed, an electronic payment order is forwarded to the NetBill server for execution. Once executed, the merchant's server will send the key that the consumer can use to unlock the acquired intellectual property.

The utility of this approach is most attractive in scenarios where the cost of an item is so low that the credit card processing cost is burdensome. However, this approach does impose on the consumer the requirement to install additional software, and to incur transaction costs beyond that which must already be paid, e.g., bank transfer costs, service fees and the like. The NetBill paradigm assumes that information is sold by the page, for cents per page. Actual experience to date has not confirmed that this is not the case.

2. Summary

Some Web-based vendors feel that there may be a problem with these mechanisms in that the user has to "buy" the e-cash before they spend it. Until they are ubiquitous, this may lead to the situation of not being able to capitalize on an "impulse buy" if a user were to run out of e-cash. In a future study, INPUT will analyze these payment technologies and their prospect for future acceptance.

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VI

Enabling Technologies

This chapter reviews the technologies, protocols and standards that will enable the continued growth of electronic commerce over the Internet.

A
Summary of Enabling Technologies

The multiplicity of standards is one of the reasons that such growth is held back at the moment. However, resolution of the protocol options to a broadly supported standards set is forthcoming in 1996.

INPUT has identified four enabling technologies that are discussed in this chapter:

- Transport security

- Data security

- Presentation protocols

- Electronic data interchange translation software

These technologies directly affect how a user transacts electronic commerce over the Internet, whether EDI-based or over the WWW. One of the reasons that security is required in an electronic commerce environment is that we need a reliable and secure framework for the payment of goods and services over the Internet.

Two layers of security are needed, and INPUT differentiates between them in the following manner:

- *Transport Security* assures that the communications session between the client software and the server software is secure. For example, the Secure Sockets Layer (SSL), after an encryption key exchange and authentication process, ensures a secure communications session. Transport security provides "channel security," which allows client/server applications to communicate in away that cannot be eavesdropped upon. This security, however, only exists between the applications, and does not address the security of the data after it has been communicated.

- *Data Security* protocols provide additional security of specific data within the message being transmitted. Because transport security protocols are application independent, protocols that address data security can be layered on top of them. In credit card payment situations, for example, the transmission of the credit card number to the vendor's applications server would be secured by transport security, but the next step of passing the number to a credit card authorization center would not be protected. Because the transport security protocol does not address the security of the data after the communications session (that is, once the vendor has the credit card information), then end-to-end security is needed, and can be provided by data security. The choice of the data to be secured, and to what extent that data is secured, is a decision made by the applications developer.

The common thread through most of the protocols is the reliance on a digital signature, which is created using a public/private key pair generated using RSA data security technology. This technology, however, requires that there be a trusted third party, known as a Certification Authority (CA), to certify the key pair as being owned by a particular person (distinguished names). Without the establishment of a network of CAs, it is difficult to authenticate someone's digital signature. INPUT views this as a significant issue confronting electronic commerce over the Internet, and encourages organizations that have a credible position in the marketplace, such as the VANs, to review this opportunity to facilitate resolution of this issue. The U.S. Postal Service is proposing to become a CA, and is in a strong position to do a good job, based on its perceived longevity and the mail fraud laws in place.

B
Transport Security

Exhibit VI-1 shows the two protocols currently proposed for transport security: Secure Sockets Layer (SSL) from Netscape and Private Communications Technology (PCT) from Microsoft. These protocols are designed with the objective of providing secure channel authentication and privacy between two transacting parties. In this application, the server is always authenticated and the client is authenticated at the server's option.

Exhibit VI-1

Transport Security Protocols

Protocol	Lead Sponsor	Status
SSL	Netscape	In Use
PCT	Microsoft	Under Development

Source: INPUT

They operate in the following manner:

- There is a handshake sequence between the client and the server that negotiates an encryption algorithm and a session key, as well as authenticating the server to the client.

- Once complete, all transmitted data is encrypted using the negotiated session key. To ensure integrity of the data, the protocol creates a message authentication code, or digital signature.

- The documentation for SSL and PCT does not make any reference to how the server would authenticate the client. As SSL currently operates, and as PCT is proposed, the server can optionally authenticate the client.

SSL was presented by Netscape in 1994 and was updated in 1995 to provide alternative key exchange algorithms, hardware tokens, and additional authentication protocols. During 1995, PCT was proposed by Microsoft. Microsoft feels that PCT resolves security weaknesses within the SSL proposed standard.

The objectives of these two protocols are the same: to provide and maintain a secure communications link between a browser and a WWW server. INPUT believes that these standards should be brought together. Support for differing, but similar, protocols unnecessarily increases the overall costs of doing business. INPUT anticipates that standards convergence will happen in 1996.

C

Data Security

Exhibit VI-2 lists many of the data security protocols designed to protect the contents of an SMTP/MIME message on an end-to-end basis. These protocols use different approaches to prevent access to the data contents of a message.

Exhibit VI-2

Data Security Protocols

Protocol	Lead Sponsor	Status
STT	Microsoft-Visa	Draft IETF Specification
SEPP	Netscape-MasterCard	Draft IETF Specification
PEM	IETF	In Use
PGP	Public Domain	In Use
MOSS	TIS	Under Development
Secure MIME	RSA Inc.	Under Development
Secure HTTP	Terisa	Under Development

Source: INPUT

Unfortunately, the credit card companies are backing competing proposals. Visa is behind STT, and MasterCard is behind SEPP.

- Secure Transaction Technology (STT) is being developed by Visa and Microsoft. The protocol has been proposed to secure the payment transaction when the payment is made using credit cards. The credit card number is encrypted using RSA public key cryptography, while other financial information is encrypted using DES private key encryption. The authentication of the encrypted data is to be managed by a trust hierarchy, similar to a Certification Authority (CA) but established by Visa. INPUT's view is that this proposal presents problems to the development community because it does not base itself on Internet and ISO standards, such as ASN. This makes it a proprietary proposal. However, many of Microsoft's development efforts become de facto standards, hence must not be discounted. However, it appears that Visa support for SST is weakening.

- Secure Electronic Payment Protocol (SEPP) is proposed by Netscape, MasterCard, CyberCash and GTE. This standards-based proposal also addresses the user community's concerns about secure transmission of payment-related information, specifically credit card numbers. In a similar fashion to STT, the credit card number is encrypted via public key cryptography. However, the authentication framework is in line with proposals for Certification Authorities for public key management. VeriSign and Trusted Information Systems are examples of such organizations. The USPS is evaluating how best to address this opportunity. It is MasterCard's stated intention to have a secure system in place by April 1996.

Other alternatives for data security include Pretty Good Privacy (PGP), Privacy Enhanced Mail (PEM), MIME Object Security Services (MOSS), or Secure MIME (S-MIME). The first two are useful when the business data is contained in the body of the message, whereas the latter two address situations in which the business data is included in the E-mail message as a MIME object.

- PGP is a public domain encryption mechanism that uses both the Digital Encryption Standard (DES) and a public key cryptographic process. It has not followed the Internet's standards track, so is unsuitable for use in electronic commerce applications. It is often used for the digital signature and encrypting of electronic mail.

- PEM is an older standard produced by the Internet Engineering Task Force (IETF). It is generally used for the digital signature and encrypting of electronic mail. Due to some inherent technical inflexibility, it is unsuitable for the exchange of electronic commerce messages. Some implementers of security have combined PGP and PEM to create a PGP/PEM mechanism.

- MOSS is a more flexible extension of PEM for the digital signature and encrypting of electronic mail, and was introduced during 1995. By providing Internet-standard key management interfaces, MOSS has the possibility of supporting electronic commerce. The protocol is based on non-RSA algorithms, and has yet to be widely used in the marketplace.

- S/MIME was also introduced during 1995. RSA introduced this alternative to MOSS as the limitations of PEM became apparent. It is built around RSA's security mechanisms. To date, there have been few market implementations of this technology.

On the WWW, the protocol used between WWW clients and servers is the HyperText Transfer Protocol (HTTP). Its ease of use has prompted a lot of interest in implementing a wide variety of applications. Many such

applications require the client and the server to authenticate each other and to transfer data confidentially.

Secure HTTP (SHTTP), now supported by Terisa, provides secure communications mechanisms between an HTTP client/server pair. It encrypts the message files that flow to and from the HTTP server and client. SHTTP supports both public key/asymmetric encryption and private key/symmetric encryption. It also supports the digital signature and key management approaches used by RSA data security products.

It is intended that the SHTTP protocol will support SSL in its next release, which would enhance its interoperability across the Internet. Given the similarity between SST and SEPP, it is INPUT's view that these protocols should be brought together.

D

Presentation Protocols

Presentation protocols relate to the way in which WWW information is stored in the server and accessed by the browser. Exhibit VI-3 lists the Presentation protocols and their current status of implementation.

Exhibit VI-3

Presentation Frameworks

Framework	Co-ordinator/Developer	Status
HTML	IETF	1.0 - Released 2.0 - Soon 3.0 - Should be a standard in 1996
VRML	Silicon Graphics	First release shipping, new versions under development
JAVA	Sun Microsystems	First developer kits are starting to be available, significant investment in applications development is being undertaken.

Source: INPUT

HTML was defined as a document format, derived from SGML, as part of the initial development of the WWW. SGML originated at IBM and was adopted as a CALS standard for transferring documents between systems using plain text characters. It was already widely adopted in some segments, such as publishing, government and manufacturing. HTML provides a document format that enables documents to be transferred across the Internet and displayed according to rules set in the receiving device. Pointers can be placed within HTML documents that link the user to other documents on the Web.

During 1995, Virtual Reality Modeling Language (VRML) was proposed to provide a 3-D view of the data and text, and the JAVA application development environment introduces interactive capability to the WWW.

- HTML is undergoing rapid development, from the first version 1.0 as written by Tim Berners-Lee, to the recent standard version 2.0 to a version 3.0 expected in 1996. The reason for this development is the increasing demand for multimedia capabilities. Unfortunately, the developers may be moving too fast. The IETF committee responsible for HTML 3.0 recently issued an RFC asking whether the standards track should be maintained for 3.0, or if the HTML standard should be allowed to splinter for the time being to see which features truly are in demand. The conflict arises from a shopping list of features that developers wish to add to HTML. The standards process is such that not all user/developer requests make it into a standard. This does not sit well with the server developers who see some competitive advantage in offering further functionality.

- VRML is still its early stages. Released in April 1995 by Silicon Graphics Inc. (SGI), version 1.0 is being tested and evaluated on a number of WWW sites, and some WWW browsers now support it. By providing a 3-D perspective to WWW pages, VRML will heighten the WWW experience and also provide a more realistic multimedia environment than is currently available on the WWW.

- JAVA was announced during 1995 by Sun Microsystems and was quickly adopted by a number of WWW server and browser development companies. JAVA is a development environment that allows the WWW server to download, to a compatible browser, a mini-program called an "applet." In this way, the server application can invoke the compute power of the client and bring the application to life in a way that would not otherwise be possible, given the limited bandwidth between the client and server. Thus, it becomes easier to deliver time-sensitive data from the server. A full JAVA standard and suite of tools will be available in 1996. Symantec is one of the first software vendors to announce a developers' kit called Espresso, which is a modification to its C++ development environment.

It is INPUT's view that these three enablers will play significant roles in encouraging the development of a flexible and powerful environment for electronic commerce. By being able to accurately visualize a product (VRML), or interact with a process (JAVA), a user will be better equipped to make a choice and, therefore, a purchase. Other enablers are coming from Macromedia that support the Shockwave environment for animating Web sites and from DigiCash that provide an electronic wallet in which to contain digital cash. Many more enablers are being developed and deployed and

leaders will emerge. There is expected to be a rash of EDI enablers from VANs, accounting software vendors, leading systems software vendors and transaction processing vendors over the next few years.

E

Electronic Data Interchange Software

To further enhance the Internet for electronic commerce, EDI translation software developers are looking at providing an additional capability to their EDI translators to interoperate with the Internet.

This capability has the characteristics listed in Exhibit VI-4.These characteristics would be implemented in an add-on module that would be installed in a fashion similar to the network communications modules currently offered by EDI software companies.

Exhibit VI-4

Characteristics of an Internet-capable Module

- RFC 822 SMTP mail envelope
- RFC 1767 MIME/EDI
- ANSI-X12.58
- Private key (DES) support
- Public key (RSA) support

Source: INPUT

To date, Premenos' Templar is the only product available that gives EDI translators the ability to become interoperable with the Internet.

Because EDI data is more highly structured than Internet E-mail data or WWW HTML forms data, its transport and security needs differ. The five characteristics listed in Exhibit V1-4 provide the capability to exchange EDI documents over the Internet securely and reliably.

- RFC 822 is an Internet standard that describes the format of an electronic mail message. SMTP is the protocol by which an electronic mail message is delivered. Unlike the EDI VAN environment in which the receiver ID of the ISA segment is used as the addressee, the "To:" in the message header is used by SMTP.

- EDI messages are structured messages. Since an E-mail message is, in itself, not structured, an EDI message is included in an E-mail message as a MIME object in adherence to RFC-1767. RFC 1767 describes how to use the MIME encapsulation protocol to include EDI data. Each MIME object has a "content type." For EDI transaction sets, the MIME content type for standards-based messages is either "Application/EDI-X12" or "Application/EDIFACT," as appropriate. For non-standards-based messages, it is "Application/EDI-Consent."

- Securing an ANSI X12 transaction set for transmission over the Internet requires support for Version 2 of the ANSI ASC-X12.58 EDI security and encryption standard. To send the resulting secured message content through the Internet's SMTP mail system, the secured message content must be modified to be compatible with either the Base64 or Quoted Printable encoding techniques comprehended by the MIME encapsulation standard. The reason is that SMTP expects the transmitted file to contain plain ASCII text. Because the encryption techniques embodied in X12.58 introduce special or unprintable characters, the algorithms used for securing the EDI data can be enabled to convert the special characters into a format compatible with either Base64 or Quoted Printable.

- As part of implementing support for X12.58, the Internet-aware module will also support DES session key generation, encryption and decryption, as well as public key (RSA) authentication, encryption and decryption, and digital signature capabilities.

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VII

Trends and Issues

This chapter discusses the trends and issues affecting the growth of electronic commerce over the Internet.

A
Trends

1. Growth of Virtual Private Internets

As industry becomes more adept at Internet-based commerce, there will be an opportunity to develop industry-specific subsets, or overlays, on the Internet. A product such as TradeWave Corp.'s "TradeSecret" is positioned to enable these applications. Based on Northern Telecom's (Nortel) Entrust security system, it encrypts data and establishes mechanisms and procedures to permit access only to authorized users.

For example, a company can install the TradeWave server and distribute the browser to its clientele as the front end to the company's applications. Through the implementation of access levels and authorities, different users would be able to accomplish different activities. Subscription-based services would find this capability very powerful.

- It is important, however, that the browser retain compatibility with the Internet at large. This is because users will be less inclined to use it if it results in restricting their choices. Any vendor following this strategy would want to be sure to integrate the front-end process with existing browsers.

- The flexibility and availability of hardware and software on the market today will permit an organization to distribute specialized front ends. For example, the parts and service department of a service center could access the database and catalog of a manufacturer's products, or the service call/resolution records of the manufacturer's technical support groups. The advantage of using this technology over using CD ROM-based approaches is that the data is always going to be the most up to date possible. This is further discussed in *Electronic Catalogs, Web Storefronts and Internet Malls.*

2. Operating System Déja-vu

In the early days of computing, the architecture was of an intelligent central system surrounded by dumb terminals. In the growth of the personal computer industry over the past 15 years, distributed operation of systems has been driven by the desire to make access to information easier.

In the last 18 months, as a result of the WWW's capability to cross-link widely separated sites, information has become even more distributed, yet still easily correlated and coordinated. The Internet is becoming the operating system for the information society, with the servers and clients effectively becoming peripherals.

With this perspective, we see a return to the centralization that characterized the first computer systems. This is the concept behind IBM's Network-Centric Computing initiatives, and the "hollow Internet computers" espoused by Oracle and others.

However, there is a fundamental difference between the network management philosophy today and that of earlier years. Management is now distributed to the Internet server level, as opposed to being centralized. This enables applications to be somewhat independent of each other, which significantly speeds the rate of development. As a result, we can expect the high rate of innovation to continue, and no one should be complacent about the ability of competitors to proceed very quickly with electronic commerce implementations.

3. Consolidation of Internet Service Providers

- To grow and prosper in 1996, ISPs will have to tailor their offerings to support large-scale commercial use of the Internet. Examples would include provision of audit trails, 24-hour customer support lines, message tracking and bandwidth upgrades. Smaller ISPs that do not attract business customers, or cannot afford to expand their services, will be absorbed into the larger players with a national presence, such as BBN Planet, PSI, UUNet, Netcom and others.

- Accommodating business will be accomplished by the use of products such as Computer Associates' Unicenter/ICE (Internet Commerce Enabled). Unicenter/ICE is a suite of systems and network management applications. By configuring the software for the Internet, it will help ensure end-to-end transaction management, recovery, and routing in a secure manner, thus supporting the service enhancements noted above.

4. Internet Usage Access Levels

- As previously noted, usage of the Internet for commercial purposes has developed in two directions, WWW-based commerce and EDI-based commerce. Both have differing service level requirements, as their needs for speed, confidentiality, and access are not the same.

- WWW users need security and assured connectivity to Web sites. They generally do not need the extensive support systems, relationship building assistance, message traffic backup and audit trails services to which EDI users assign high priorities.

- To service both WWW commerce and Internet EDI markets and users, ISPs will have to offer different service packages, as well as time-of-day pricing, volume discounts, support packages, and various access capabilities tailored to a user's requirements. By establishing alliances with major telecommunications organizations, they can back up these offerings with dependable network topologies to service users of WWW commerce or Internet EDI.

5. Changing Cost Structures

- With the differentiation of EDI-based commerce from WWW-based commerce, ISPs will need to price their services to address the respective sectors. VANs, such as AT&T EasyLink, have already followed this path in giving their electronic mail and electronic data interchange different price structures.

- As ISPs offer more services to business, and raise their prices accordingly, they will start to infringe upon the territory of the VANs. This will put pressure on the prices that VANs charge, and the overall effect will be a lowering in the perceived differential between the Internet and the VAN costs.

6. Copyright

- The inadvertent inclusion of copyrighted material in Web sites presents an ongoing issue for the electronic commerce community, for it can incur significant legal penalties.

- IBM and Novell are two companies that are working on this problem, using a technology called "secure containers." The technology protects the copyright of electronic text, video, or sound files, no matter how many hands they pass through. It provides a sound electronic commerce solution to a significant business challenge.

- Secure containers are cryptographic envelopes that not only encrypt the file, but add a layer of rules about how the file may be used, and by whom. With the inclusion of a compatible Web server, the user pays for the use of the document through the act of opening the file and providing the requested information. This is then authenticated and forwarded to a copyright clearinghouse, such as Copyright Clearance Center, Inc. in Danver, Mass.

B
Technical Issues

1. Persistent Client-side States

- Knowledge about the "state" of the client-side software, or browser, is important to enhancing the range and power of Web-based applications. Currently, browsers are "stateless" to the Web server. That is to say, a browser cannot store information that a server may need during a session or between sessions. This technology is called COOKIES. The IETF has a draft specification published for discussion and review. It should be noted that General Magic and AT&T have already implemented a language (Telescript) for consumer messaging that manages persistence.

- For example, a subscription-based Web site requires that the user enter the ID and password every time the user accesses that site. If the browser had a state, then this information could be stored in the browser, and the server would simply request it from the browser's files. This would make operations over the Internet between client and server much simpler and quicker.

- By giving the client side a state, electronic commerce over the WWW will operate more efficiently. Trading partner information and various IDs can be stored for ready access. Shopping applications can also be made more flexible by having the browser store information on what has been selected during the session. This minimizes the server's processing overhead by eliminating the need for it to keep track of the user's preferences and selections.

2. Real-Time Protocol (RTP)

- The connection between a client and a server is of a non-continuous nature. The connection is repeatedly opened and closed. This consumes a lot of the user's time, especially if the application is interactive in nature. If the information is static, that is, informational in content, this issue is less burdensome.

- The IETF has published several draft specifications concerning RTP and related protocols, Resource Reservation Protocol (RSVP) and IP router alerts. With increasing use of the WWW for electronic commerce applications such as ordering, inquiries, credit card authorizations, it becomes important to support immediate response methodologies.

- For example, in the travel, insurance or health care industries, claims, inquiries and authorizations are required on a very timely basis. By maintaining an open connection between client and server, no time is lost during the submission and response cycle as the browser is waiting for the host to respond. The travel, insurance and health care industries have recently been at the forefront of developments in interactive EDI and in the use of the Internet.

3. WWW Server Push

- The Internet's cost structure, and various proposed Internet protocols, make it possible to provide a "server push" methodology wherein the server sends out information proactively, rather than passively waiting for a user to visit the site.

- Today, a user can participate in the initial implementations of server push technology by registering with a Web site and giving an E-mail address. The registration could be for product updates, announcements of mall specials, "joke of the day," press releases, or the like.

- This technology can also be used to permit a shopping mall, catalog vendor, or corporate purchasing department to send targeted advertising to specific users. This approach enables marketers to use the Internet to be proactive in helping users find what they want. This technology will play a major role in supporting the expansion of electronic commerce over the Internet.

C
Security and Key Management

The foundation of electronic commerce over the Internet will be solidified by the widespread implementation of standardized security protocols. Many of the proposed protocols utilize the RSA data security cryptography platform. In order to use this platform successfully, the sender and the receiver have to have access each other's public key. At this time, the Certification Authority (CA) concept is not yet fully implemented. Networks of CAs are required for this purpose.

To date, trading partners have worked around this limitation by using other means of exchanging keys and certifying each other's ownership of the keys, such as face-to-face conversations, telephone calls or mail. This approach is unworkable for widespread, secure electronic commerce.

To address this issue, two organizations have been established to set up the required CA network infrastructure. They are VeriSign (a subsidiary of RSA Data Security Inc.) and Trusted Information Systems. More CAs are required and various organizations, like the USPS, are evaluating how best to play a role in satisfying this need.

As discussed in Chapter IV, VANs who are pursuing the open connectivity strategy state that they will handle the management of public and private keys at their Internet gateways. VANs are in a good position to establish and maintain databases of their subscribers' public keys and their certificates, because of their central role in providing network services to a large number of companies.

![VIII]

Recommendations

This chapter contains a set of recommendations for the EDI VANs and EDI translation software vendors, as well as WWW server vendors, and those who sell on the WWW using the server products.

A
Recommendations for EDI VANs

The EDI value-added networks are capitalizing on emerging business opportunities by offering connectivity for their customers and trading partners to the Internet. This open support should add momentum to the implementation of EDI and electronic commerce within small and medium-sized enterprises.

VANs who have not yet made decisions about Internet strategies are encouraged to establish competitive offerings. The provision of Internet connectivity services based on the open connectivity model described in Chapter IV is capable of providing the level of connectivity and serviceability the market appears to be looking for.

Currently, there does not exist a widely distributed directory of companies and organizations that have implemented EDI, and the types of EDI transactions implemented. With an Internet E-mail connection, a directory like this could be positioned to respond to inquiries from companies or individuals looking for trading partners with whom they could establish, or expand, their own EDI programs. IETF draft protocols have been published that address the setting up of directories such as these.

VANs, because of their market position, have an opportunity to play a leadership role in the provision of this kind of information via the Internet. GEIS-MSN has taken steps in this direction with a lookup system within Windows 95, and both Harbinger and Sterling have announced, but have not yet detailed, a centralized trading partner directory service. If clients of

other VANs start using these services, they may be at risk of moving to the VAN that provides the service.

The expertise that VANs have can also be applied to resolving a significant issue within electronic commerce over the Internet, that being public key management.

The establishment of directories as above will allow VANs to maintain the information concerning the public keys of the trading partners. VANs have the presence and the credibility to act as Certification Authorities. To provide CA services, the VANs would have a ready-made database of organizations (their clients) that they could certify. INPUT recommends that VANs investigate these paths.

B
Recommendations for EDI Translation Software Vendors

EDI translation software companies have a number of opportunities in the growing Internet electronic commerce market. In EDI-based commerce, the EDI software companies have an opportunity to expand their markets by offering an add-on module that makes their software Internet capable.

EDI software vendors can compete in the Internet/EDI marketplace, and expand their markets, by implementing technologies similar to Premenos' Templar. As discussed in Chapter VI, there are five features that comprise a solution for Internet-based EDI.

As an alternative to building their own Internet capability, EDI software vendors should evaluate licensing Templar from Premenos. This could allow them a quick entrance into a growing market.

Companies selling goods and services over the Internet have identified back-office automation as a key priority for 1996. Much of this automation will have to do with generating electronic orders to their suppliers. In easing this integration, EDI software vendors have a significant role to play and a market opportunity to capitalize upon.

To this end, EDI software vendors should work with WWW server vendors to develop interfaces that facilitate the integration that WWW-based vendors are looking for, or risk being bypassed.

C

Recommendations for WWW Server Vendors

To support the growth in commercial use of the Internet, the WWW server vendors have an opportunity to ensure that the security and communications protocol standards are interoperable. Standards that are not interoperable are costly to maintain, hinder innovation, and make it difficult for consistent operations to be established. As a result, they will slow development of the complete market.

WWW server developers can encourage more work within the browser technology to implement "persistent state clients." Though this is a new protocol proposal, it is one that will allow for a more rapid expansion of electronic commerce through the minimization of overhead at the server level. This, in turn, would allow WWW-based vendors to concentrate on content development and delivery.

INPUT's survey of WWW-based vendors, in INPUT's report *Electronic Catalogs, Web Storefronts and Internet Malls,* found that the costs of developing and setting up a WWW site are significant. Integrated site development tools must be available. The current set of tools, such as HTML publishing, CGI script managers and image graphics managers, are, generally, not interoperable. Looking at the lessons from the PC industry, consumer demand only took off once software applications were able to communicate with one another. An integrated suite of WWW site development tools will have a similar impact and, as a result, fuel significant expansion in electronic commerce. Internet software developers will find a high demand for a product suite of this kind.

To ensure cost-effective operations, a set of back-office integration tools is required to assist a Web-site manager to connect the Web site to supporting databases and applications such as EDI, order entry and credit card authorization. Currently, these processes are often handled manually, which imposes unnecessary costs and inefficiencies. To help minimize these costs, WWW server vendors should work closely with applications software developers and EDI software vendors to simplify the APIs required to support this interconnectivity.

D

Recommendations for Vendors Who Distribute Using the WWW

Vendors need ways to help them retain the customers who visit and make purchases. They are aware of the need to keep their storefront interesting. Successful vendors are those who know their market and develop services to differentiate themselves.

One of the technologies that WWW vendors could consider is "server push." Although server push is not yet commercially available, a vendor can start in this direction by offering to keep the customer up to date via E-mail. With the user registered, the vendor has a means of enhancing the relationship with that customer.

By using the registration process to gather information about the customer, the vendor gains:

- Knowledge of the customer base, upon which market and business planning can be performed

- A mechanism for customer retention

- A source of participants for surveys of buying tastes and interests

Many vendor sites are passive in nature. To build up business, they need to become more interesting to their visitors. Creative use of buyers' profileswill generate the requisite traffic for sales. The on-line creation of discount coupons, special offers and information exchange based on a customer's profile will bring a sense of immediacy and relationship to a medium that can otherwise be static and cold.

Web sites looking for an advantage over their competitors should consider the creative use of JAVA and VRML. These two technologies can deliver a level of interactivity and realism that will assist vendors in establishing differentiated sites. Integrated with the server push, vendors could use these technologies creatively to develop a stable and growing customer base.

For example, a combination of JAVA and server push could be used by an investment or brokerage company to keep investor clients up to date. If the client decides to effect an investment decision, then a JAVA applet could be initiated that reflects the investor's decision.

For a service and support Web site offered by an equipment manager, a service request could be resolved by the display of a 3-D explanation of the solution. VRML supports this 3-D rendering of objects, so that the viewer, a

technician in this example, is better able to understand the actions to be taken.

E
Recommendations for Internet Service Providers

ISPs should expect to feel competition from the major network service providers (largely telcos), upon whom ISPs depend for their communications lines. ISPs have the advantage that they work more closely with customers than do the telcos, but it is likely that the telcos will commoditize the Internet access business that is a core part of ISP revenue today. INPUT recommends that ISPs capitalize on the knowledge that they can sell to the telcos, either by cooperative ventures or by preparing themselves for acquisition on favorable terms.

As ISPs develop special services for business Internet access, they will find themselves competing with the VANs that are just now implementing Internet strategies. INPUT recommends that ISPs become familiar with the VAN business situation so that they can decide whether to compete head-on with the VANs, or search for niches in which to specialize.

Some VANs have announced that they are getting into the Web publishing business. This is traditionally an important source of revenue for ISPs, so ISPs should become very aware of the VAN capability so as not to lose this business.

F
Recommendations for Companies Considering a WWW Presence

Companies with no current Internet strategy should immediately start to develop one. The hype surrounding the Internet has raised its visibility, and has raised expectations to unreasonable levels. Thus, when the occasional security failure does occur, the negative impact of this news is accentuated. As with any new technology, learning how to use it properly is an important first step. In the majority of the cases of security failure, the root problem has been an inadequate understanding of the proper implementation procedures to be used. This is now being addressed, and recognition that the Internet can be a secure platform for commerce will soon be widespread.

Products such as Aurum Software's WebTrak Internet Marketing Module let companies create HTML electronic forms on a Web server. When these forms are filled in by customers, the information on the forms is read into a company's internal databases for action. Combined with workflow technologies, a customer's service request can be acted on quickly. Early implementation of this type of application can give a company a competitive

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advantage. However, companies should expect that such an advantage would be short lived as competitors implement the technology also.

Similarly, companies have an opportunity to upgrade some of their existing systems to interconnect with the Internet directly. For example, FedEx's use of the Internet to allow customers to track their packages has had the benefit of reducing paperwork and reducing the workloads of the toll-free operators. By making its site interesting, FedEx is also achieving its goal of customer retention.

Working with a business-oriented ISP, a company can achieve payoffs such as:

- Acquisition of detailed customer demographics and feedback

- Understanding customer usage patterns

- Collection of comments and suggestions from customers and prospects

With this detailed and current information in hand, a corporation can develop well-targeted marketing and sales plans and anticipate new trends in user requirements.

Through connectivity to the WWW, the corporation will also gain the benefits of savings in mailings, handling and printing, and heightened visibility in the marketplace.